THE CIVILIZATION AT A CROSSROADS: CONSTRUCTING THE PARADIGM SHIFT

Gennady Shkliarevsky

TO LENA, DIMA, ANDREA, AND AMELIE

CONTENTS

Acknowledgement

I want to acknowledge my profound debt to Lena, Dima, Andrea, and Amelie who have been a constant source of inspiration, encouragement, and support in all my endeavors.

INTRODUCTION

From its emergence many millennia ago human civilization has been constantly evolving. The process of this evolution has not been smooth and steady. It has been very uneven and accentuated by periods of revolutionary transformations that have dramatically affected the way we live. The term "punctuated evolution" that Steven J. Gould has introduced to describe the biological evolution seems very appropriate in relation to the evolution of our civilization. Indeed, its progress has involved some extraordinary shifts: from society of hunters and gatherers to sedentary agriculture, to the industrial revolution.

There are many indications that our civilization is currently undergoing a similarly dramatic shift. Over the last several decades it has experienced some very powerful changes. Technological innovations have transformed our production. The broad use of robots, computers, and automata is increasingly replacing humans in performing repetitive and routine mental and physical work. It has dramatically affected the way we work and has contributed to the transition of our economy to a new and more productive phase that we alternately refer as knowledge economy, creative economy, or information society. This new phase represents a decisive shift in the types of investments we make, the new dominant forms of production we develop, and the character of our labor force. To the degree much larger than ever before, the new economy places a premium on creativity, innovation, and new ideas. The revolution in communication technologies has provided an unprecedented access to sources of information and knowledge, which has enormously accelerated the pace of innovation. It has also brought people around the world much closer together than they have ever been. The magnitude of these changes is staggering; it is clearly on the scale of the great transitions in the past that have led to what we call the paradigm shift—the adoption of new organizing principles that transform our social practice, relations, and institutions.

Yet the current period of transition is not unproblematic. In fact, we face numerous problems. Today, as in the past, our civilization appears to be at a crossroads. The world that has emerged in the wake of the cataclysm of the Second World War and that has been so stable and so enduring for quite some time, finds itself once again in the grip of uncertainties. Our social and political order seems to be coming apart, our economy stagnates, our environment is in degradation, and our international security system is under a constant threat of war and terrorism that appear to be impervious to all our attempts to curb them.

There is a growing sense in our society today that the solutions to the problems we face will require more than mere adjustments in specific policies. Many observers believe that the crisis we face is a systemic one and it requires systemic solutions. They feel that what we need is a genuine change of paradigm—a fundamental shift in the way we organize our life and practice.

The subject of paradigm shift has become quite popular these days. The number of contributions on this subject is on the rise. Most of these contributions fall into roughly two categories: reductionist and eclectic. The reductionist category includes proposals that see the solution in effecting a paradigm shift in one particular area. Tariq Banuri's article "Sustainable Development is the New Economic Paradigm" is a good

example of this approach.[1] The eclectic approaches are broader and more diverse. They generally bring up several problem areas that are critical in shaping the current crisis. An example of such approach is Andrew Targowski's article "Sixteen Related Crises and the Limits of Civilization in the 21st Century."[2]

The strength of the majority of these contributions is their pragmatic activist orientation. They tend to point to specific problems and make recommendations for their solutions. Their pragmatic activism is also their major weakness since they rarely, if at all, address theoretical issues as to the mechanism of paradigm shift or why they occur. The lack of theoretical grounding certainly diminishes the impact and appeal of these studies.

Paradigm shifts are still a largely underinvestigated subject. Perhaps the best-known work on this subject is the book *The Structure of Scientific Revolutions* by Thomas Kuhn, the famous historian of science. When the book first appeared in 1962, it almost immediately became and still remains a source of much controversy.[3] Although the book discusses the making of paradigm shifts in the evolution of science, its conclusions have resonated with fields far beyond the history of science.

The term "paradigm shift" is Kuhn's invention. He used this term descriptively and applied it to situations in the evolution of science that involve a replacement of one form of science practice with another.[4] The sense in which Kuhn used this term conveys the meaning of the modern term "phase transition" that is currently used in a variety of disciplines and theoretical perspectives.

Paradigm shifts, Kuhn maintains, may not be as abrupt as they appear to historians of science and culture and, in fact, may have been in preparation for quite some time, but this fact ultimately does not affect the discontinuous nature of change and its character. Paradigms, Kuhn insists, are incommensurable to one another, separated by an unmistakable divide.

Kuhn's book provides a detailed description of paradigm shifts. He does not venture into the question of why they occur. In fact, he largely takes an agnostic position on this matter. Kuhn argues that one paradigm is certainly no better than the other, either in the precision and detail of the descriptions it supports or in its predictive power. He contends that in this respect the anterior paradigm may, in fact, be superior to the posterior one since its proponents have had more time to develop it and accumulate the evidence in its support. The only advantage, Kuhn suggests, that a new paradigm may have in comparison with the old one is of an aesthetic nature: it may be simpler and more elegant. Kuhn also denies that the transition from one paradigm to another marks any

---

[1] Tariq Banuri, "Sustainable Development Is the New Economic Paradigm," *Development*, vol. 56, no. 2 (June 2013), pp. 208–17.

[2] Andrew Targowski, "Sixteen Related Crises and the Limits of Civilization in the 21st Century," *Comparative Civilizations Review*, vol. 69 (Fall 2013), pp. 23-32.

[3] Thomas Samuel Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1970).

[4] There is much confusion in the discussion of what a paradigm is. Margaret Masterman, for example, insists that the concept of "paradigm" is inherently fuzzy (Margret Masterman, "The Nature of a Paradigm," in Imre Lakatos and Alan Musgrave, eds., *Criticism and the Growth of Knowledge: Proceedings of the 1965 International Colloquium in the Philosophy of Science* [Cambridge: Cambridge University Press, 1970], 59 -90). On Kuhn's use of the term, see Ahmad Khurshid, "Global Economic Crisis Need for a Paradigm Shift," *Policy Perspectives*, vol. 8, no. 2 (December 2011).

kind of progress in science—in fact, he denies the existence of any progress toward any identifiable goal in general. This contention is perhaps the most controversial aspect of Kuhn's book that has troubled many of his critics.

Paradigm shifts are a major focus of this book. In addressing this subject, the book combines both a theoretical and pragmatic approach. Its theoretical perspective views paradigm shifts primarily in terms of transitions from one level of organization to another. In contrast to Kuhn's denial of progress, this study maintains that emergent new levels of organization have a distinct advantage over those that contributed to their emergence: they have greater combinatorial power and more degrees of freedom.

On a pragmatic side, this book is largely in agreement with other contemporary contributions that argue in support of a paradigm shift. In contrast to the existing studies, this book argues that our civilization should transcend the Enlightenment tradition that dominates it and embrace the process of creation as its new organizing principle.

The process of creation is another major interest of this book and it is closely related to the subject of the paradigm shift. Several considerations motivate this connection. As Kuhn has pointed out, paradigms are incommensurable to one another. Incommensurability of paradigms suggests the emergence of properties that have not existed prior to their emergence, which is how we often define creation. Thus one can conclude that the rise of new paradigms is a result of the process that makes creation possible.

The process of creation is ubiquitous in our universe. The evidence is all around us: from minute particles to atoms and molecules, to planets, stars, and galaxies. Life and its many forms—from simple organisms and plants to higher animals and to humans—are perhaps the most astounding examples of creation. The process of creation is the source of our civilization. It is the main engine of the evolution of our social life and culture that has given rise to many ingenious new levels and forms of organization. Human knowledge without which our civilization simply cannot exist is a product of the process of creation.

The developments that have taken place during several last decades bring even more into relief the importance of the process of creation and creativity. As has already been mentioned, due to the rapid advancement in technological innovations, robots, computers, and automata are increasingly replacing humans in performing routine and mechanical physical or mental tasks. Machines easily outperform humans in executing such task. There is only one type of work where machines cannot replace humans. Machines cannot create. They can only do what humans program them to do. If the current pace of technological innovation continues—and there is no reason to believe that it will subside—creative work will be the only type of employment where human labor will be essential and indispensible. There are many signs that indicate the likelihood of such development. The demand for creativity and creative solutions in our society is on the rise. Our economy puts a premium on creativity with new creative types of businesses, investments and financing, services appearing on a daily basis. There is a reason why we refer to the modern economy as knowledge economy or creative economy. Creativity plays an increasingly important role in our society. The appearance of the term "social entrepreneurship" is certainly indicative of the trend to use creativity and business know-how in addressing social and environmental problems.

The momentous revolution in the field of information and communication also contributes to the growing emphasis on creativity. This revolution has enormously facilitated access to information. It has also brought people from all over the world much closer together than ever before. These changes are contributing to a much more rapid circulation of knowledge and exchange of ideas than at any previous time in history. These advances create conditions that are favorable for production of knowledge that increasingly becomes the basis of modern economy, absorbing an increasingly large portion of our investments and human labor.

Yet, as important as creativity and the process of creation are in our economy and society, we know very little about it. The article with a symptomatic title "The Creativity Crisis" that appeared in *Newsweek* in 2010 makes an astute observation:

> Creativity has always been prized in American society, but it's never really been understood. While our creativity scores decline unchecked, the current national strategy for creativity consists of little more than praying for a Greek muse to drop by our houses.[5]

This dearth of knowledge about the process that plays such an important role in our civilization makes utilizing our creative capacity and managing our creative work more difficult and less efficient, thus impeding our progress.

As has been indicated earlier, we live in a paradoxical time. Over the last few decades our civilization has experience momentous changes that inaugurated a new stage in its evolution. However, we are also facing very serious and still unresolved problems that require creative solutions. Yet despite its enormous achievements, our civilization has failed to produce such solutions. We seem to have run up against our own creative power: we have created problems that we lack creative power to resolve. We do not seem to be able to master and control our own creativity.

These considerations explain the central focus on this book on the process of creation. The focus on the creative process and creativity raises a number of important theoretical issues: What is creativity? Can we control our creative capacity? How do we produce knowledge? Can we manage knowledge production and make it efficient?

In addressing these and similar questions, this book relies on three major relevant theoretical perspectives. One of them emerges from the studies of the famous Swiss psychologist and philosopher Jean Piaget. Piaget's theoretical contributions have particular relevance to the subject of this book since they deal with a qualitative transition from one way of organizing reality to another, or the change from one state of the system to another. Paradigm shifts also represent qualitative transitions from one state to another; and Piaget's insights into this process helps to understand the mechanism of creation. In addition, the book also brings in two major contemporary theoretical perspectives that are relevant to the process of creation—constructivism and the theory of knowledge creation organization. The latter theoretical perspective is particularly important, as knowledge production is one of the main driving forces in the current transition period. This study looks into the theories and discussions of issues related to knowledge production and its implications. Finally, this book is informed by a number of theoretical approaches that are relevant to the phenomena of phase transitions and the

---

[5] Po Bronson and Ashley Merryman, "The Creativity Crisis," *Newsweek*, July 10, 2010.

rise of new levels and forms of organization, such as systems theory, theory of emergence, complexity, and self-organization.

Hardly anyone has any doubts as to the benefits that the process of creation and creativity offer to our civilization. The importance of this process is hard to overestimate. Yet, surprising as it may be, the process of creation is relatively peripheral in our social practice and institutions. The Enlightenment tradition that dominates our civilization pays little attention to the process of creation since, in its view, this process is largely inaccessible to reason. The study of this process and its mechanism is still in its incipient and inchoate stage with little theoretical grounding. As a result, the process of creation and creativity remain peripheral to our social practice and institutions.

There is only one conclusion that can follow from the recognition of the seminal role of the process of creation in the evolution of our civilization, in general, and its growing importance in the current transition period: our civilization must fully embrace the process of creation. We will have to devote more time and effort to studying this process and understanding how it works. We should also develop specific social practices that would enhance and foster our creative potential. We will have to transcend the Enlightenment tradition and move beyond the its dominant paradigms. Such transcendence does not mean that we should abandon this tradition. On the contrary, it means that we will conserve, enrich, and expand this tradition beyond its current limits.

The book is organized in nine chapters. Chapter One discusses the current search for a paradigm shift. Chapter Two focuses more centrally on the process of creation. Following a brief overview of the path that led to the emergence of the process of creation and its mechanism as an object of study, the chapter focuses on the contribution of Jean Piaget to our understanding of the mechanism of creation. Chapters Four through Seven show the connection between the failure to embrace the process of creation and some of the most important problems we face today. Chapter Eight discusses the two important contemporary perspectives—constructivism and knowledge production organization theory—that deal with designing knowledge production practice. Chapter Nine discusses the ways that the adoption of the process of creation as the central organizing principle of our civilization will affect our social practice. The closing chapter will summarize the main arguments and draw final conclusions.

CHAPTER ONE

IN SEARCH FOR A NEW PARADIGM

We live in a paradoxical time. The last several decades in the history of our civilization have been the period of enormous progress. The development of science and technology has helped us achieve new growth in productivity, conquer crippling diseases, and improve the quality of life in general. The growing pace of innovation has created new industries, offered new products, and provided new services. Globalization has brought advantages of economic progress to many underdeveloped nations of the world and opened many new markets. The Internet and communication technology have greatly increased the flow of information and brought people from different parts of the globe closer together. These are just some of the achievements that have transformed our civilization beyond recognition; and the pace of innovation does not subside but continues at an accelerated rate.

At the same time our civilization is now witnessing the increasing growth of instability and disorder. The sluggish pace of economic development for much of the world is a source of constant concern. The distribution of the fruits of this development has been extremely uneven and the gap between the rich and the poor is growing wider. The middle class is in decline even in the developed countries. As a result of the slow economic growth, many governments have seen their revenues go down and expenses grow. The response has been the reduction of services and benefits for the needy. The welfare state—the proud achievement of liberal democracy—is a thing of the past with many programs drastically reduced or even completely eliminated. The demise of the welfare state creates much uncertainty and even anxiety as many wonder what, if anything, will replace it and how the general wellbeing of society will be maintained in the future. While advancing economic progress in underdeveloped areas, the globalization has also revealed huge disparities among rich and poor nations of the world.

Our environmental problems are another major cause for concern. Despite concerted efforts by world governments, business community, and social activists, environmental degradation continues at an unabated pace. The climate change is constantly and ominously looming on the horizon, posing a serious threat to the survival of many communities and their way of life. The ongoing social and political unrest—terrorism, violence, shifting balance of powers, and protest movements—add more real and potential dangers to our turbulent world.

How can we make sense of these paradoxical developments? Why are we having these problems? Are they transitory? Will they eventually pass or are they the precursors of something much worse in store for all of us?

The presence of a paradox signals that some fundamental changes may be under way. The problems we face have not just befallen us. They are man-made. We have created them. This fact is an indication that we have sufficient power to produce these problems but we have not acquired the power needed to solve them. It suggests that we have been able to unleash forces that our civilization cannot control, that something in the way our civilization is organized is out of sync with reality of our existence and that

prevents us from solving the problems we face. It means that we are more powerful and more powerless at the same time.

The problems we face and the instability they cause create a great deal of uncertainty and a growing sense of anxiety in our civilization. What makes this uncertainty particularly troubling is the fact that there does not seem to be any way of resolving these problems. Liberal democracy that has been the dominant force in organizing and maintaining the global order over the past several decades, and certainly since the end of communism, has so far failed to offer any coherent and clear course of action. On the contrary, it is mired in unproductive conflicts, political rivalries, indecision, deadlocks, contradictions, and overall lack of progress that offer little hope that we will see the solutions any time soon.

The political malaise that has engulfed, for example, the United States and Europe is a good case in point. The consensus that emerged after WWII and that oversaw the unprecedented growth of prosperity during the post-war years is in shambles. The growing chasm between the main political parties in the United States constantly threatens to paralyze American politics. The bickering and rivalry dominate the political scene and consume much energy needed for solving problems. The leaders of both political parties mostly rehash old themes and offer few new ideas.

There is a growing sense in our society that the solution for our current predicament will require new and bold initiatives; that solving the problems we currently face will take nothing less than a paradigm shift. The pressure for a paradigm shift comes from several directions.

One direction has to do with technological and economic changes that are the source of dramatic social transformations. Technological innovations cause a dramatic shift in our economic production comparable to the great shifts of the past from hunting and gathering to sedentary agriculture and on to industrialization. The new shift marks the transition from production of things to production of knowledge. Knowledge production today takes a growing amount of our resources both in terms of investment and labor force. The emerging new economy places a premium on creativity and innovation, much of it due to the expansion of our knowledge.

The rapid advancement of technology and science, the wholesale introduction of increasingly sophisticated robot and computers, and now the information and communication revolution are changing our lives. They are displacing human labor from performing routine physical and mental tasks. This trend will undoubtedly continue to evolve. The projected numbers even with the allowance for excess are very telling. According to these numbers, there will be 90% fewer lawyers needed in the not so distant future. Computers and sensitive devices will be performing diagnostic tasks that today require medical expertise of highly skilled doctors. There will be self-driving cars delivering goods and passengers to their destinations, 3D printing on order, and much, much else. All in all, about 70-80% of jobs in existence today will disappear in the next 20 years. Although these numbers are mere extrapolations that may or may not be precise but the overall story they tell is still very impressive.

Few expect the world population to decline as dramatically as is the projected increases in the above numbers. The world population is likely to grow, even if at a slower pace. This growth in combination with the deterioration of our environment and climate change portend massive problems in the very near future

The changes we experience are very encouraging and at the same time disturbing. There is an increasing realization that if these changes continue unabated—something we have every reason to expect—they will require major transformations in all spheres of our life. The belief that piecemeal adjustments simply will not do is rapidly spreading. Many observers, commentators, and even ordinary people begin to think that nothing short of a systemic paradigm shift will do to address the problems we face. They also wonder whether liberal democracy that has been presiding over unprecedented success that has taken place since WWII is capable of accomplishing this task.

Efforts to find alternatives to liberal democratic order are very much under way. As has already been mentioned, most contributions on this subject could be subdivided into two categories: reductionist and eclectic. The reductionist category includes proposals that see the solution in effecting a paradigm shift in one particular area. The article "Sustainable Development is the New Economic Paradigm" by Tariq Banuri is a good example of a reductionist approach. The author sees the solution of the crisis of our civilization in a new conception of sustainable development. Banuri does not provide many details as to what this new model of sustainable development might look like. Rather, he outlines conditions that, if created, will allow us to contemplate a positive future. These conditions include discarding policies of market liberalization and neo-liberal approaches in operationalizing sustainable development and recovering a message of hope that should move us beyond distrust toward mutual cooperation and shared human values.[1] Ulrich Bech emphasizes the need for a fundamental restructuring of power relations on the global scale. His proposed solution is a shift from methodological nationalism to methodological cosmopolitanism.[2] For Michael MccGwire, international order is also where the sources and the solutions of our current problems lie.[3] John Moravecs regards the transformation of education as the key to the success of our civilization,[4] as does Jacob Neusner in his article on new modes of learning.[5]

Quite a few contributors see the need for a more general change in our overall perspective on reality or ethical values. According to Duane Elgin, for example, our problems arise from viewing reality in terms of non-living mechanistic system. He proposes to approach reality as a "living system"—one that "seems to have properties we attribute to living systems." In his view, this "living system perspective" will transform our "sense of identity, purpose, meaning, and ethics."[6] In a similar vein, Garry Jacobs sees the need to reject the contemporary mechanistic approach toward reality in favor of a more "holistic, synthetic, organic mode of thinking." He also recommends moving away from disciplinary methodology in studying society toward "an integrated science of society based on common principles." The new paradigm, in his view, should be

---

[1] Banuri, "Sustainable Development Is the New Economic Paradigm," p. 216.
[2] Ulrich Beck, "Reframing Power in the Globalized World," *Organization Studies*,vol. 29, no. 5 (May 1, 2008), pp. 793–804.
[3] Michael McGwire, "Shifting the Paradigm," *International Affairs (Royal Institute of International Affairs)*, vol. 78, no. 1 (2002), pp. 1–28.
[4] John W. Moravec, "A New Paradigm of Knowledge Production in Higher Education," *On the Horizon*, vol. 16, no. 3 (2008), pp. 123–36.
[5] Jacob Neusner, "When Intellectual Paradigms Shift: Does the End of the Old Mark the Beginning of the New?" *History and Theory*, vol. 27, no. 3 (1988), pp. 241–60.
[6] Duane Elgin, "A Living Systems Perspective for Humanity's Future," *World Future Review*, vol. 7, no. 2–3 (November 1, 2015), pp. 253–60, p. 253.

"human-centered"; its foremost preoccupation must be "the right of every human being to peace, security, welfare and well-being."[7]

Many reductionist perspectives bring up very valuable points that contribute to our understanding of the scope of the current crisis. However, they all suffer from one fundamental flaw. Each of them focuses on a particular aspect of the current crisis, while ignoring the rest.[8]

The eclectic contributions are broader and more diverse in their approach. They generally bring up several problem areas that are critical in shaping the current crisis. Andrew Targowski is perhaps the most extreme example in this category. He sees at least sixteen concurrent specialized crises: from science and education to economics, politics, and more.[9] For Geoffrey Glasby, the main problem areas are the population growth, wasteful exploitation of resources, and expansive consumption patterns. He recommends political actions aimed at curtailing the population growth, careful husbanding of resources, and general frugality as essential solutions.[10] In their "Plan B 4.0: Mobilizing to Save Civilization," Charles Francis and Lester Brown combine specific proposals for energy use through design and conservation, the shift toward renewable energy, improved designs for cities to limit the use of energy and water, educational practices for population control, restoration of forests, grasslands, ocean, and the attendant biodiversity, and finally the nutrition programs to combat famines.[11]

Finally, the contributions on the subject of paradigm shift include various communitarian perspectives, including socialism. Their advocates propose to replace the traditional liberal focus on the individual with a focus on community and its needs. The contributions by Nafeez Ahmed, a British journalist and political activist, are a good example of this trend. In his writings Ahmed has articulated an extensive agenda for saving our civilization. His book *User's Guide to the Crisis of Civilisation: And How to Save It* is the most comprehensive representation of his position and is in many way typical for communitarian perspectives.[12]

Being a journalist, Ahmed is less constrained in his writings by methodological hang-ups. He moves freely between eclecticism and reductionism. He provides an extensive list of specific areas that require critical attention: from environment to economics, to politics and the deficit of democracy, and the general culture of consumer capitalism. Like some other critics, he tends to see capitalism and preoccupation with personal gain as chief culprits.

Like many other communitarian critics, Ahmed views what he describes as the crisis of our civilization in systemic terms. In his view, this crisis is not a result of the

---

[7] Garry Jacobs, "New Paradigm: The Necessity and the Opportunity," *Cadmus*, vol. 2, no. 2 (May 2014), pp. 9–23, p. 20; see also Garry Jacobs, "Uncorking the Future: Transitions to a New Paradigm," *Cadmus,* vol. 2, no. 4 (May 2015), pp. 69–82.

[8] William C. Winegard, *For Whose Benefit? Report on Canada's Official Development Assistance* (Ottawa: Government of Canada, 1987).

[9] Andrew Targowski, "Sixteen Related Crises and the Limits of Civilization in the 21st Century," *Comparative Civilizations Review*, vol. 69 (Fall 2013), pp. 23-34.

[10] Geoffrey P. Glasby, "Sustainable Development: The Need for a New Paradigm," *Environment, Development and Sustainability*, vol. 4, no. 4 (2002), pp. 333–45.

[11] Charles Francis and Lester R. Brown, "Plan B 4.0: Mobilizing to Save Civilization," *Renewable Agriculture and Food Systems*, vol. 25, no. 3 (September 2010), pp. 252–53.

[12] Nafeez Mosaddeq Ahmed, *User's Guide to the Crisis of Civilisation: And How to Save It* (London: Pluto Press, 2010).

failure in this or that particular area or policy, but the ongoing collapse of the entire system of global industrial capitalism. Arguing essentially along the Marxist lines, Ahmed claims that the main source of this systemic failure is the dispossession of the vast majority of the population—the fact that they are denied the ownership of the means of production—that leads to other systemic failures in such areas as climate change, food insecurity, financial and economic instability, political turmoil and terrorism.[13]

While there is much in Ahmed's book that one can agree with, his analysis does raise some question. In light of the Soviet experiment with socialism, one wonders whether Ahmed is right in viewing industrial capitalism and its production relations as the single most important factor in the systemic crisis of our civilization. After all, public ownership of the means of production did not prevent the collapse of the Soviet Union. Evidently, there may be important sources of the systemic crisis of our civilization other than just the separation of producers from the means of production. Ahmed is not particularly specific in his proposed solutions for the current crisis. This is not to say that he does not provide some specific recommendations in many areas. He most certainly does. However, he does not explain how these particular solutions will work as a systemic whole that he calls "the post-carbon civilization." His argument for a holistic approach does not appear to be particularly convincing. He contrasts his holistic approach to the atomistic approach of industrial capitalism. While one can agree with Ahmed about the shortcomings of the atomistic approach, the holistic approach, as has been argued elsewhere, also has its shortcomings.[14] Holistic perspectives, for example, cannot explain the emergence of the whole that determines interactions of particular components, and neither does Ahmed. In the end he proclaims the need for the adoption of new ethical attitudes and values, thus indicating that his specific proposals depend on ethics. Yet he provides no justification as to why ethics occupies a preferred place in his cache of solutions.[15]

Paradigm shifts involve more than just aggregation of individual changes. According to Thomas Kuhn, who has originated the term and used it in his explanation of scientific revolutions, paradigm shift requires a new way of viewing reality and involves adoption of new axioms, premises, or tenets.[16] In extending Kuhn's view of paradigm shift to civilizations, one could say that a paradigm shift involves new principles that we can use for organizing our civilization.

In this respect, all contributions on the subject of paradigm shift in the evolution of our civilization have so far failed to produce a synthetic overarching conception, a generalized frame that would integrate all specific recommendations as its particular

---

[13] Ahmed, *User's Guide*, p. 248.

[14] Gennady Shkliarevsky, "On Order and Randomness: A View from the Edge of Chaos," arXiv:1104.4133 [physics.hist-ph], April 20, 2011.

[15] Ahmed, *User's*; also Nafeez Ahmed, "Review: The Great Transition—The New Paradigm," *Resilience* (December 24, 2014), http://www.resilience.org/stories/2014-12-24/review-the-great-transition-the-new-paradigm (accessed March 30, 2016).

[16] Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1970). See also, Joel Isaac, *Working Knowledge: Making the Human Sciences from Parsons to Kuhn* (Cambridge: Harvard University Press, 2012), particularly "Lessons of the Revolution: History, Sociology, and Philosophy of Science," pp. 191–226; Stuart P. M. Mackintosh, "Crises and Paradigm Shift," *Political Quarterly*, vol. 85, no. 4 (October 2014), pp. 406–12; Linda Cochrane, "Society and the Scientific Paradigm," *International Journal of Science in Society*, vol. 2, no. 1 (January 2011), pp. 193–200.

cases. A system, such as civilization, certainly requires such integration. Irena Ateljevic notes this fact in her insightful piece "Transmodernity: Integrating Perspectives on Societal Evolution." She, among others, proposes to use the term "transmodernity" to designate such generalized framework. However, the introduction of a new designation certainly does not amount to a solution of the problem of integration—the fact that Ateljevic herself recognizes in her article.[17]

This coverage of the select contributions on subject of the paradigm shift gives some idea about the degree of concern regarding the future of mankind that exists in our civilization today. Yet it also shows that this concern remains largely unresolved. There is still no comprehensive answer to the question as to what the future direction of our evolution may be. What could be the new organizing principle or principles can integrate the recommendations that address specific problems we face?

A growing number of people feel that creativity will be essential for solving the problems we face today.[18] They come from many areas and all walks of life: politicians, activists, pundits, businessmen, public figures, scientists, and many others. Speaking at a forum devoted to the world economic crisis, Eric Schmidt, CEO of Google, made a revealing comment: "We are going to have to innovate our way out of this thing [economic crisis]."[19] This remark succinctly summarizes what many researchers, business people and politicians think today. Whether it is technological devices, new creative businesses and forms of financing, entrepreneurship (a euphemism often used for creativity), or new products, our business community believes that creativity is the way out of our current morass. It is not accidental that we often refer to our modern economy as creative.

The growing demand for creativity and creative solutions is a sign of our time. The fact that many people think that creativity is the answer to our problems is not a definitive proof that it is so but it does tell us something. It signals the emergence of a new paradigm in which the process of creation is the main principle for organizing our social practices and institutions.

Experience is a good teacher. Past successes may prove to be helpful in charting a path toward the future. There are few periods in human history that have witnessed more dramatic advances of civilization than the period since WWII. These successes may suggest, at least in general terms, what the path toward the solution of our current predicament may be.

During the post-war period liberalism and liberal democracies led by the United States have been the dominant force in our civilization, particularly after the collapse of

---

[17] Irina Ateljevic, "Transmodernity: Integrating Perspectives on Societal Evolution," *Futures*, vol. 47 (2013), pp. 38–48. See also, L. M. Ghisi, "Transmodernity and transmodern tourism," Keynote presented at the 15th Nordic Symposium in Tourism and Hospitality Research: Visions of Modern and Transmodern Tourism, 19–22 October, Savonlinna, Finland, 2006; E. Dussel, "Transmodernity and interculturality: an interpretation from the perspective of philosophy of liberation," http://www.enriquedussel.org/txt/Transmodernity%20and%20Interculturality.pdf, 2004 (accessed April 12, 2016); E. Dussel, "World-system and 'trans'-modernity," *Nepanthia: Views from the South*, vol. 3, no. 2 (2002), pp. 221–244; C. Venn, "Altered states: post-enlightenment cosmopolitanism and transmodern socialities," *Theory, Culture & Society*, vol. 19, no. 1–2 (2002), pp. 65–80.

[18] Bronson and Merryman. "The Creativity Crisis."

[19] As quoted in H. Holden Thorp, *Engines of Innovation the Entrepreneurial University in the Twenty-First Century* (Chapel Hill: University of North Carolina Press, 2010), p. 1.

communism. Contemporary liberalism is hardly a theory or a doctrine. Rather, it is first and foremost a remarkably dynamic social and political practice. It is this dynamism that has ensured the past successes of liberal democracy.

The history liberalism goes back a long way. It demonstrates the extraordinary flexibility of liberalism and its enormous capacity for change. Over the course of its history, liberalism has experienced a dramatic evolution and has in many ways transformed itself. Many of its original concepts have undergone a profound rethinking. Major new ideas have become an integral part of liberal philosophy and practice. The extent of the changes has affected the way we think about and understand liberalism today.

Open-mindedness and inclusion have been critical to the social and political practice of liberalism. These features, more than anything else, account for the remarkable longevity and the persistent appeal of liberalism. The extension of the liberal promise to the growing number of people has led to the introduction of new ways of organizing our society and politics. As has already been mentioned, the most prominent results of these efforts were such innovations as modern representative democracy, the New Deal, the welfare state, the Great Society programs, advances against racism, progress in reducing the oppression of women and in promoting minority rights, and much, much else.

In the course of this dramatic evolution liberalism has in many ways transcended its original boundaries. At its inception, the main preoccupation of liberalism was the individual and the protection of individual rights. Indeed, liberalism has not lost this original focus in the course of its evolution. Rather, it has significantly expanded its agenda by adding new issues and concerns to the traditional ones. Probably the most remarkable addition was the inclusion of a broad communitarian dimension that has dramatically changed the original vision and focus of liberalism. The inclusion of this dimension was largely responsible for the rise of modern Western democracies and the welfare state.

As has been pointed out earlier, the thriving of liberalism has been to a large degree due to its strategy of inclusion. In the course of its history, liberalism has tried to extend its promise to a constantly growing number of people: from lower classes to women, to minorities. In the international arena, it has tried to make the fruits of progress available to underdeveloped nations. The implementation of this strategy required the re-invention of liberalism and the creation of new and increasingly more powerful levels and forms of organizing the social and political practice of liberalism. Thus the process that has created these new levels and forms has ensured the success of liberalism in the past.

There are also counter examples that support this point. The collapse of the New Deal consensus with its inclusive approach at the end of the 1970s marks the beginning of the demise of liberal success. Reagan and Reaganomics began the process that enhanced the domination of the elites, both economic and political. This process culminated in the rise of neo-liberalism that effectively married political elites with top economic and managerial ones in the interest of market rationality. The results of this unsavory marriage have been disastrous to say the least: several major economic setbacks, including the financial crisis of 2008 that dramatically shook the world economy, the continued deterioration of the environment, the acceleration of the erosion

of the middle class, the growing political paralysis and instability, and the dramatic expansion of disorder around the world.

One would think that in search for a new direction we should focus more centrally on what has made our civilization successful in the past: the expansion of democracy by pursing a social and political agenda that is based on inclusion. In other words, one would expect that we should aggressively pursue the creation of new and increasingly more inclusive, hence more powerful, levels and forms of organizing our society, and that we would use a more comprehensive and systematic approach in trying to make the very process of construction to be the main principle for organizing our social and political practice. Yet, surprisingly, the process of construction has not and does not play much of a role in the perspectives that are currently dominant in our civilization. Neither theory nor practice of contemporary progressive liberalism suggests any appreciable efforts to create new alternatives; much less make them the main focal point.

Dynamism is the most essential and characteristic feature of reality. Our world is constantly evolving. In the course of this evolution new and increasingly more powerful levels and forms of organization of reality emerge. This evolution would be impossible without the process of creation. Since our civilization is a product of this evolution, one can hardly overestimate the importance of this process for our civilization. By disregarding the process of creation we leave the most essential part of reality outside our frame of vision. The result can only be a very limited view of reality. The way we view reality affects the way we interpret it and, consequently the way we act. An inadequate view results in inadequate interpretations and mistaken actions. We simply cannot have an adequate understanding of reality without taking into consideration the process of creation.

Despite the importance of this process, we know surprisingly little about it. In fact, it was not until relatively recently that the process of creation became a legitimate subject of interest to scientists, scholars, and the broad public. The exploration of the subject of creativity has inspired several new developments that have begun the process of fundamentally reshaping our worldview. There is a whole range of new theoretical perspectives that address issues relevant to the process of construction. They include such interdisciplinary perspectives as systems theory, theory of emergence, complexity, constructivism, theory of self-organization, and chaos theory, among others. These theoretical approaches focus on a broad range of phenomena that occur both in macro and micro domains, and cover various disciplines which study different levels of the organization of reality: from physics and chemistry to meteorology and weather science, to computer science, biology, psychology, economics, sociology, and linguistics. The theory of self-organization finds application, for example, in the studies of such diverse phenomena as collective behavior of animals,[20] insect behavior and swarm intelligence,[21]

---

[20] Iain D. Couzin and Jens Krause, "Self-Organization and Collective Behavior in Vertebrates," *Advances in the Study of Behavior*, vol. 32 (2003), pp. 1–75.

[21] Claire Detrain and Jean-Louis Deneubourg, "Self-Organized Structures in a Superorganism: Do Ants 'behave' like Molecules?" *Physics of Life Reviews*, vol. 3 (2006), pp. 162–87; Mark Fleischer, "Foundations of Swarm Intelligence: From Principles to Practice," arXiv:nlin/0502003v1 [nlin.AO], 2 Feb 2005 (accessed on January 4, 2009]; Simon Garnier, et al., "The biological principles of swarm intelligence," *Swarm Intelligence*, no. 1 (2007), pp. 3-31.

ball lightning,[22] weather patterns,[23] behavior patterns of fish schools,[24] and even linguistic processes.[25]

However, as Thomas Kuhn has noted, paradigm changes are never easy. The contours of the new visions are quite vague, its concepts are fluid, and its vocabulary is still in development. Its foundational propositions require more systematic elaboration and experimental confirmation, which requires a great deal of support, including funding. Although these new theoretical perspectives are gaining in popularity, they are still not part of the academic mainstream. They often encounter resistance from those who still adhere to the entrenched traditional paradigm. The process of integrating this new vision into our social, political, economic, scientific, and cultural practices is still in its initial stages. Much has to be done before our civilization could start reaping the benefits that these new perspectives can bring.

Human creativity is the most valuable and practically infinite resource at our disposal. So far we have not been using this resource very efficiently. Despite the growing importance that many attribute to creativity and the process of creation, our knowledge in this area still remains limited, which may explain why the process of creation remains marginal in organizing our social practices and institutions.

Few have doubts about the benefits that human creativity brings. Making the process of creation the main organizing principle of our practices and institutions will enhance creativity that many regard to be the key to solving our problems and ensuring the sustainability of our civilization.

This book seeks to make a contribution toward this change. The following chapter will explain in some detail the mechanism of the process of creation and its main features. This explanation should help the reader to understand the connection between the failure to embrace the process of creation and some of the most important problems we face that will follow in subsequent chapters.

---

[22] Erzilla Lozneanu, et al., "Ball Lightning as a Self-Organized Complexity," arXiv:0708.4064v1 [nlin.PS] (accessed September 23, 2008).

[23] T. N. Palmer, "Quantum Reality, Complex Numbers and the Meteorological Butterfly Effect," arXiv:quant-ph/0404041v2 (accessed November 3, 2008).

[24] Steven V. Viscido, et al., "Factors influencing the structure and maintenance of fish schools," *Ecological Modeling*, vol. 206 (2007), pp. 153-165.

[25] Vito Pirelli, et al., "Non-locality all the way through: Emergent Global Constraints in the Italian Morphological Lexicon," http://www.aclweb.org/anthology/W/W04/W04-0102.pdf (accessed July 20, 2008).

CHAPTER TWO

UNDERSTANDING CREATION

The Process of Creation and the Enlightenment Tradition

There is a wonderful process at work in our universe. As we look around, we see its remarkable creations: particles, atoms, stars, planets, galaxies, life, and much else. The roots of this process go to the very nature of our universe.

The main property of our universe is its uniqueness: it is all there is. There is nothing outside it; in fact, there is no outside. As there is nothing outside our universe, nothing can come into it and nothing can disappear from it because there is nowhere to disappear. Consequently, everything must be conserved. Conservation originates in the uniqueness of our universe and is essential to its existence.

Conservation requires resources and energy. Our universe is a closed system. Resources and energy required for conservation can only come from inside the universe. Transformation and change is the only way to secure new flows of resources and energy required for conservation under the conditions of a closed system: the system must change.

Our universe contains an enormous variety of different systems. In order to conserve themselves, these systems must expand their range of possibilities, or degrees of freedom. Gaining new possibilities requires new properties, that is, properties that have had no prior existence; in other words, it requires an act of creation. New properties can arise only as a result of the emergence of the new and more powerful levels of organization. Conservation is impossible without the process of creating such new levels of organization.

We humans are also creations of this process. As its creations we are also part of this process and we have inherited from it our capacity to create. Over the course of our history we have demonstrated this capacity in works of art, in science and technology, in organizing our social life and institutions. Our civilization itself is a remarkable evidence of our creativity. It is the source of our power and prosperity.

Given the importance of the process of creation in our life, one would expect that we would use it as the main organizing principle of our civilization. Yet odd as it may seem, this process is not central to the ways we organize our practices and institutions. We still do not even have a clear understanding of the process of creation. Discussions relevant to this subject generally focus on conditions that foster creativity, rather than what this process is and what it involves.

There is a good reason why our understanding of creation is still lacking. Knowledge production is essential to our civilization. We strongly believe that the survival and evolution of our civilization vitally depend on our capacity to know. Knowledge production plays an increasingly important role in the life of our society. For this reason, the way we view knowledge and knowledge production defines our practice and institutions.

The way we view knowledge has its roots in the Enlightenment. The Enlightenment tradition has had the dominant influence on our civilization. Hardly any aspect of our civilization has escaped its pervasive impact. It has in many ways shaped our life: from politics to economics, to social relations and culture. It has also shaped our view of knowledge.

We view knowledge primarily in terms of one-to-one correspondences between our mental constructs and what we observe in the real world. Whether in its empirical variety that views knowledge as being inferred from observing reality or in its rationalist version, according to which our mind deduces knowledge from some fundamental axioms, or self-evident truths, or in the more modern approach that sees knowledge is "justified true belief," the prevailing general view is that knowledge consists in establishing one-to-one correspondences between our mental constructs and empirical observations. This understanding of knowledge has shaped our practices and institutions: science and technology, educational system and teaching methodologies, business environment and economy, legal and political system, culture, and much more

Establishing correspondences is essentially an equilibrating operation: it produces equilibrium. In other words, we associate knowledge with equilibration. As a result, we view the production of disequilibrium that is involved in an act of creation as essentially inaccessible to knowledge. Thus we place creation largely outside the domain of knowable and in the realm of the irrational.

The recognition of the process of creation as inaccessible to knowledge makes creation peripheral to our organized practice: what we do not know we cannot control and apply systematically. For this reason, the process of creation remains largely marginal in the paradigm that dominates our civilization. In very real and practical terms (even if not in theory) we diminish the significance of the process that plays an extremely important role in the evolution of our civilization; for all practical purposes, this process has been and remains relatively unimportant in shaping our social and institutional practices.

Even the recognition that creation and creativity play an important role in the production of knowledge has little effect on our practice. In his book *The Beginning of Infinity: Explanations that Transform the World* David Deutsch argues that creation is central to knowledge production. "Discovering a new explanation," he writes, "is inherently an act of creativity."[1] Yet he offers no indication that the process of creation is in any way accessible to our understanding. Invoking the neo-Darwinian theory of the evolution that sees random mutations that are post-factum selected for fitness as the principal source of evolutionary change, Deutsch stresses that creative insights are little more than "guesses," "bold conjectures" that the human mind creates by "rearranging, combining, altering and adding to existing ideas with the intention of improving upon them." In his view, all this rearranging and combining is a product of "*inborn* expectations and intensions" and "an *innate* ability" to improve upon existing ideas and theories.[2] Indeed, Deutsch sees the need for experimental confirmation of such guesses and conjectures—a sort of selection for fitness that he envisions—but such confirmation hardly plays any role in the production of new theories and ideas.

---

[1] David Deutsch, *The Beginning of Infinity: Explanations that Transform the World* (New York: Viking, 2011) p. 7.

[2] Deutsch, *The Beginning of Infinity*, p. 4 (emphasis added).

Deutsch's references to innate and inborn factors suggest the connection with biology and, thus, to irrational causes. He offers no elaboration as to what these factors might involve and how they guide our search. The closest he comes to any rational explanation of creation is when he suggests, following Karl Popper, that our sense of beauty—that is, our emotional sphere—provides guidance in search for "a good explanation."[3] In other words, even in Deutsch's mind, creation as the production of disequilibrium remains firmly embedded in the realm of chance and the irrational and, therefore, hardly usable in the rational organization of our social practice and institutions.

Discovering the Mechanism of Creation

The Enlightenment tradition is not uniform. Its richness and diversity accommodate many ambivalences and ambiguities. While this tradition largely relegates creation to the domain of the irrational, it has also sustained the quest for understanding creation.

The quest for understanding the process of creation has a long history. Its roots reach deep into the time of the Antiquity. Creation is central to the Judeo-Christian tradition. The pursuit of understanding creation has not been a quest of a lonely genius. It has not been limited to one particular sphere of inquiry or a specific discipline. On the contrary, in many ways this quest represents a complex project that has followed multiple paths.

Two principal milestones have been crucial in the quest for understanding creation: one was the emergence of the evolutionary thinking and the other was the recognition of the individual autonomy and agency. It is beyond the scope of this study to provide a detailed account of how these developments came about or to trace the causal relationships among many diverse factors that produced them. A very general overview will be quite sufficient to show the broad context that gave rise to the understanding of the mechanism of creation.

Ancient Greeks were aware of the fact that reality is constantly changing. They viewed it as a continuous flux of events like the river flow or clouds moving across the sky. This flux, however, was not chaotic. Rather, it followed a prescribed cyclical pattern, like day and night or seasons in nature. In the universe they imagined, there was no global progress towards some identifiable goal; all changes were local in the sense that they did not affect the pre-established global order. As changes followed one another in infinite cycles of iterations, no real advances occurred. Seasons followed one another in endless flow of transformations and each cycle was no different than the other. Ancient Greeks saw the same cyclical pattern in the social and political sphere where some states emerged while others disappeared; where oligarchic rule followed democracy only to be displaced by tyranny that, in turn, gave way to democracy. Nothing represented this mode of thinking in endless cycles better than the myth of eternal repetition the life and death cycle in the myth of Dionysus—one of the most important Greek gods.[4]

---

[3] Deutsch, *The Beginning of Infinity*, p. 18.

[4] Sarah B. Pomeroy, Stanley M. Burstein, Walter Donlan, and Jennifer Tolbert Roberts *Ancient Greece: A Political, Social, and Cultural History* (Oxford: Oxford University Press, 1999).

The rise of Christianity dramatically transformed this worldview and replaced it with a new vision that articulated the idea of progress. We rarely associate Christianity with evolutionary thinking. After all, since Charles Darwin the evolution has been one of the most hotly debated and divisive issues between Christians and non-believers. Yet it was Christianity that introduced the notion of linear (non-cyclical) process of change, or progress, into our thinking.

According to the Christian tradition, human history was not an endless iteration of cycles, as the Ancients had thought; rather human history had a vector pointing toward the future. The evolution of history followed a linear progression from the separation of man from God, or the original sin, to the coming of Christ and then the future re-unification of man with God. In this conception, human history clearly has the beginning and the end toward which it advances.[5]

Through Christianity the concept of linear progression entered Modern European culture where it experienced many secular transmutations. It became an important organizing principle of the new tradition that originated during the period of the Enlightenment. The evolutionary unfolding of the Absolute Idea played a central role, for example, in the philosophy of Georg Wilhelm Friedrich Hegel who, in his dialectical conception of development, tried to combine the concept of linear progression with qualitative evolutionary leaps.

Karl Marx appropriated the idea of dialectical evolution from Hegel and applied it to his theory of dialectical materialism—a philosophical perspective that purported to explain the evolution of civilization. Just like Christianity or Hegel's philosophy, Marx predicates his theory of historical evolution on alienation. According to Marx, the alienation of Man from what Marx defines as species being creates a dialectical tension between the mode of production and productive forces that leads to class antagonisms and contradictions that propel the evolution of civilization toward the reunification of Man with his true nature—the species being.

The idea of linear progression also had a profound effect on science. The formulation of thermodynamic laws and the concept of entropy in the first half of the 19th century by Sadi Carnot, James Joule, and Rudolf Clausius marked a decisive shift from the Newtonian vision of a fully reversible physical reality to the view of reality as evolving toward energy equilibrium, or entropy. Later, scientists such as Ludwig Boltzmann, James Clerk Maxwell, and others, provided the statistical foundation for the theory of thermodynamics.[6]

Many contemporaries viewed the formulation of the thermodynamic laws as the most important development in European science and culture at the time. It extended far beyond original sphere of application of these laws in physics and chemistry and affected many spheres of knowledge—including sociology, cosmology, economics, and others. The laws of thermodynamics became the foundation of many technical innovations, including steam and internal combustion engine.

But perhaps the most dramatic effect of the evolutionary thinking occurred in biology. Building on the ideas of the transmutation of species—shared by, among others,

---

[5] Wim Blockmans and Peter Hoppenbrouwers, *Introduction to Medieval Europe 300–1500* (London: Routledge, 2014).

[6] Arieh Ben-Naim, *Entropy Demystified: The Second Law Reduced to Plain Common Sense* (New Jersey: World Scientific Publishing Company, 2008).

Jean-Baptiste Lamarck—Charles Darwin and Alfred Russel Wallace formulated, almost simultaneously, the theory that offered an explanation for the evolution of species and the rise of man.[7]

The formulation of the theory of evolution and its subsequent modifications turned what had been a vague hypothesis into a very influential scientific research program. Numerous subsequent discoveries, including discoveries of fossils of extinct animals, provided ample evidence that supports this theory in its main features, even if not in all significant details. This development has made the concept of evolutionary progression one of the most important organizing principles in our civilization. Thus the evolutionary thinking has become a very important part of the cultural heritage of our civilization. Appropriated from biology, in the second half of the 19th century the principle of evolution became central to many other fields of knowledge and disciplines, including the rapidly evolving new science of psychology.

Another important cultural development that contributed to the discovery of the process of construction was the recognition of human autonomy and agency--that is, our capacity to transform reality and produce knowledge. For Ancient Greeks, only nature and its gods possessed agency. Humans, in their view, were largely playthings in the hands of the divine forces. In the cosmic arena humans had no choice but to obey the will of gods. Yet even in Ancient Greek culture we can see some awareness of human agency. Despite the recognition that agency ultimately belonged to nature and its gods, Ancient Greeks also acknowledged that humans could manipulate the powers of nature to their own advantage. Consider the following excerpt from Sophocles's *Antigone*:

> There are many strange and wonderful things,
> but nothing more strangely wonderful than man.
> He moves across the white-capped ocean seas
> blasted by winter storms, carving his way
> under the surging waves engulfing him.
> With his teams of horses he wears down
> the unwearied and immortal earth,
> the oldest of the gods, harassing her,
> as year by year his ploughs move back and forth.[8]

Similar to the Greeks, Medieval Christians also did not see humans as a source of agency. Only God ultimately possessed agency. In accordance with the Christian worldview, humans had no intrinsic power to control and change reality. However, Medieval Christianity also allowed for a possibility that people could empower themselves by relying on the will of God.

It was not until the late Middle Ages, and even more so during the Renaissance, that our civilization began to embrace the notion that humans could be a source of agency. The idea that our mind was capable of creating remarkable things and transform reality excited imagination. Shakespeare in *Hamlet* and in his other plays reflects on the

---

[7] Peter J. Bowler, Iwan Rhys Morus, *Making Modern Science: A Historical Survey* (Chicago: University of Chicago Press, 2005); Edward J. Larson, *Evolution: The Remarkable History of a Scientific Theory* (New York: Random House, 2006).

[8] Sophocles, *Antigone*, translated by Ian Johnston, https://records.viu.ca/~johnstoi/sophocles/antigone.htm (accessed April 9, 2016).

dilemmas of modern man. His Hamlet is tormented by doubts as to whether the ghost of his father is a real creature or merely a figment of his own imagination. Hamlet (and Shakespeare) recognizes the power of human mind to create visions indistinguishable from reality. For Hamlet, man is the creator of his own reality.

The notion that humans could use the powers of their mind to shape their destiny became one of the most distinct features of the Modern Age, or modernity. Human autonomy and agency became a prominent theme in philosophy, literature, and sciences of the Modern period. Exploration of the self and human psyche fascinated great novelists from Flaubert and Balzac to Eliot and Dickens, Melville and James, Tolstoy and Dostoevsky.

The recognition of human agency has had a profound effect on the way humans began to view our physical universe. In his theory of relativity Albert Einstein rejected the Newtonian vision of the universe based on the premise of the existence of absolute space and time. He formulated a new theory in which both time and space depended on the perspective of the observer. Quantum mechanics also recognized that it was impossible to observe reality "as it is." Its proponents argued that the choices made by experimenters unavoidably affected the outcome of experiments. This recognition led to a new way of viewing reality. In accordance with this view, physical reality appeared as ultimately uncertain and indeterminate.

And then, of course, there was psychology—a new area of scientific inquiry that emerged in the first half of the 19th century and by the end of the century gained popularity and prestige of a well-established discipline. The practitioners of this new discipline had a profound influence on European culture. Theories of Freud, Jung, Pavlov, Adler became of interest to both specialists and the broad public; they excited literary imagination and were frequent topics of conversations in cafés and at dinner tables. Among many others, psychology attracted a young man from a little Swiss town of Neuchâtel who decided to devote his life and career to the study of human mind. His name was Jean Piaget.

Evolutionists played an important role in shaping Piaget's intellectual career. Early in his life he developed an interest in biology and published several scientific papers in this field. His first one discussing the local mollusks native to Lake Neuchâtel appeared when he was only ten. Later at the University of Neuchâtel Piaget developed interest in psychology under the influence of psychoanalytic theories.

His first encounter with the evolutionary approach in the study of nature occurred in 1911 when Piaget read the book by Henri Bergson *Creative Evolution*. The book made a profound impression on Piaget. It was through Bergson's book that Piaget learned about Darwin's teaching of evolution.[9]

The Darwinian version of the theory of evolution and its subsequent modifications—for example, neo-Darwinism that combines genetics with the theory of evolution—has attracted over the years its share of criticism, and not just from supporters of the Biblical version of the origins. There have been quite a few criticisms from the evolutionary camp. Critics have charged, for example, that the Darwinian version does not explain sudden qualitative leaps in the evolution of species. They have pointed, for example, to the Cambrian explosion of animal life that took place approximately 530

---

[9] Ulrich Muller, Jeremy I. M. Carpendale, and Leslie Smith, eds., *The Cambridge Companion to Piaget* (Cambridge: Cambridge University Press, 2009), p. 46.

million years ago and lasted for about a million years. The Cambrian period witnessed a sudden and dramatic increase in the number of animal phyla. These criticisms have eventually led two paleontologists, Stephen Jay Gould and Niles Eldredge, to formulate their theory of punctuated evolution.[10] Critics have also felt uneasy about the emphasis on randomness in the Darwinian version. To them, the evolution shows unmistakable signs of direction. Based on his study of fossils, Pierre Teilhard de Chardin, French philosopher and paleontologist, has argued that the evolution has a visible tendency toward the increase in neural functions of the organism that led to the development of human brain.[11]

Among the proponents of the non-Darwinian version of the evolution was Henri Bergson, perhaps one of the most influential French philosophers at the beginning of the 20th century. His book *The Creative Evolution* made great impression on Piaget. In this book and in his other works Bergson argues that the evolution is propelled by a powerful creative impetus, or what he calls *élan vital*. For him, as well as for Lamarck, the evolution reveals a hierarchy of being and a clear sense of direction towards the abundance of life forms culminating in spiritual life.[12] It was largely under the influence of Henri Bergson, as well as two psychologists, Alfred Binet and Éduard Claparède, that Piaget formulated the intellectual agenda that was to occupy him for the rest of his professional life.

The challenge Piaget chose to pursue was colossal. He decided to devote his life "to the biological explanation of knowledge."[13] This task involved more than just explaining the evolution within the same level of organization of reality, as, for example, Darwin did. Piaget set as his task to explain the connection between two totally different levels of organization—biological and cognitive. In order to build this bridge, Piaget had to explain how biological processes led to the emergence of a totally new level of organization. He had to explain the emergence of properties that could not be observed at the level of organization from which they emerged. The task of explaining the emergence of new properties transcended the field of psychology, or for that matter, also biology. It potentially could lead to an understanding the mechanism of the emergence of new properties in general; in other words, it could explain the mechanism of creation.

But how does one study the emergence of human mind if the information about the early development of humans is very limited? Piaget chose to follow the "example of biologists who supplemented their scanty stock of phylogenetic knowledge by turning to embryogenesis. In the case of psychology this approach led Piaget to study "the mental ontogenesis of the child at every age."[14] Piaget wanted to grasp the connection between biological functions of the organism and human mind. Ever an evolutionist, he wanted to understand how biological organization gave rise to a totally different type of organization—the human mind—thus opening a new stage in the evolution: the emergence of knowledge production, civilization, and culture. The particular point of

---

[10] Steven Jay Gould and Niles Eldredge, "Punctuated equilibria: the tempo and mode of evolution reconsidered," *Paleobiology*, vol. 3, no. 2 (1977), pp. 115-151.
[11] Pierre Teilhard de Chardin, *The Phenomenon of Man* (New York: Harper Perennial, 1976).
[12] Henri Bergson, *Creative Evolution* (London, New York: Palgrave Macmillan, 2005). See also, Ulrich Muller, Jeremy I. M. Carpendale, and Leslie Smith, eds., *The Cambridge Companion to Piaget* (Cambridge: Cambridge University Press, 2009).
[13] Muller, et al., *The Cambridge Companion*, p. 54.
[14] Jean Piaget, *The Principles of Genetic Epistemology* (London: Routledge, 2002), p. 11.

interest for Piaget was the qualitative transition from one type, or level, of organization to another. The ambitious research agenda resulted in his first major contribution on this subject *The Origins of Intelligence in Children*, first published in 1936. The empirical material that Piaget used for his book was his observations of the development of his own children: Jacqueline, Lucienne, and Laurent.[15]

The Origin of Intelligence in Children provides a detailed account of how mental images emerge from of sensory–motor operations.[16] For Piaget, the starting point in this development is reflexes that are triggered by nerve signals. Neural functions regulate and act recursively upon physiological functions (for example, muscle contraction). Signals from neurons trigger these functions into action and thus conserve them. The more frequently this triggering occurs, the more active and, consequently, more stable these physiological functions are going to be. Thus neural networks regulate physiological functions and conserve them. Combined together, neural and physiological functions constitute sensory-motor operations.

Sensory-motor operations, or schemata in Piaget's terminology, are also subject to the law of conservation. They conserve themselves in two ways. First, they become increasingly oriented toward external reality in search of stimulation. This process evolves from casual encounter with a stimulus to random groping in search of stimulation, and to a more directed search for stimuli. The directed search leads to the gradual construction of the object on the level of sensory–motor operations (although not yet on the representational level). In other words, the child begins to simulate the presence of an object that the child has assimilated in previous encounters by using sensory-motor operations (for example, simulating hand movements necessary for grasping an object). As more objects are incorporated into sensory–motor schemata (the operation which Piaget calls assimilation), the infant becomes increasingly more orientated toward the external environment.

Sensory–motor operations (for example, tactile, audio, visual, gustatory, and other functions) also conserve themselves through mutual assimilation; that is, by including each other into their assimilative schemata. One example of such mutual assimilation is the activation of the audio function by the visual one, and vice versa. Piaget discusses several such instances. For example, he notes that at a certain age when the infant hears mother's voice, the child typically begins to turn head, searching for the familiar image. Mutual assimilations of sensory-motor operations and their adaptations to each other give rise to the construction of permanent mental representations. This process is completed at the beginning of the second year of life when infants begin to look for objects that are hidden from their direct view. The search for a hidden object indicates that the object is present in the child's mind even when it is not in front of him or her; it indicates that the infant has already constructed a permanent mental image of the object.

The process that constructs mental images also involves conservation and regulation. The neural networks that regulate sensory-motor operations establish permanent connections among themselves and activate each other. Regulation stabilizes these connections and this stabilization gives rise to mental representations that are the

---

[15] Jean Piaget, *The Origins of Intelligence in Children* (Madison: International Universities Press, Inc., 1998).
[16] Piaget, *The Origins of Intelligence*.

equivalent of sensory-motor operations on the level of neural organization. These permanent mental images mark the beginning of symbolic operations, or human thinking.

A short description cannot do justice to this very rich study. Although the main theme of *The Origins of Intelligence in Children* is, as its title indicates, the emergence of symbolic thought, this study ventures far beyond the disciplinary boundaries of psychology. The intellectual orientation of Piaget's thought was decidedly interdisciplinary in nature. Such interdisciplinary approach was essential in addressing the problems that Piaget raised. His intellectual accomplishments range far beyond child psychology—the field with which Piaget's name is usually associated. The themes and topics of his research agenda involve psychology, biology, logic, philosophy, mathematics, and many other disciplines.

The process of construction/creation is one topic that is particularly important in Piaget's theoretical contributions. Piaget's first major work *The Origins of Intelligence in Children* provide a detailed examination of the problems and issues that are relevant to this process and that are further elaborated in his subsequent studies.

According to Piaget, the process of construction makes the emergence of human intellect possible. Both in *The Origins of the Intelligence in Children* and in his later works Piaget shows how interactions on one level of organization create a totally new level of organization with new properties that do not exist at the preceding level; in other words, Piaget explains the process of creation. His explanation of how this process works avoids the pitfalls of atomism and teleological holism. In his view, there is no pre-existent design for the rise of mental representations and there is nothing miraculous in their emergence. The law of conservation—perhaps the most ubiquitous law in our universe—is fundamental in the rise of human intellect. In order to conserve themselves, sensory-motor operations establish connections with each other and the external environment. This process results in the emergence of the level of organization that is more powerful than the sensory-motor operations that have produced them. The newly created whole is more than the sum of its parts. And because this level of organization is more powerful than the operations that have produced it, we cannot reduce the new level of to the one that preceded and produced it. In other words, we cannot establish direct linear causal links between the two. That is why mental representations may appear as if they emerge by a miracle from nothing, while they actually, as Piaget demonstrates, are constructed by the child who combines sensory-motor operations in the cycle involving conservation and regulation.

In this respect, Piaget's explanation is very different from other influential thinkers, such as Noam Chomsky or Jerry Fodor, who emphasize innate mental constructs in their theoretical perspectives. Chomsky, for example, explains:

> One component of the human mind-brain, then, is a genetically determined initial configuration, which we may call "the initial state of the language faculty." It is characterized by a theory of principles and parameters and a theory of markedness, which permits the extension of core grammar to a full grammar.[17]

[17] Noam Chomsky, "Knowledge of Language: Its Elements and Origins," Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences 295, no. 1077 (October 2, 1981): 223–34, p. 224. See also Noam Chomsky, "Recent Contributions to the Theory of Innate Ideas: Summary of Oral Presentation." Synthese 17, no. 1 (March 1, 1967): 2–11.

Although with some qualifications, Fodor also largely endorses the Chomskian nativism. In his *The Language of Thought* (1975), he argues (controversially) that all lexical concepts are innate.[18]

For Piaget, there are no innate mental constructs. His theory recognizes only one innate property: it is our capacity to create new levels and forms of organization. This capacity is not uniquely human. It is rooted in the conservation that is a fundamental property of our universe.

Another important topic in Piaget's study of the process of construction/creation is regulation—a structural operation that is involved in this process. As a functional operation, regulation is a product of two other important functions, assimilation and adaptation. Assimilation integrates external entities into functional operations of the organism. Adaptation accommodates these functions to external entities. Mutual assimilation and adaptation integrate the functions of the organism—the process that leads to the emergence of new operational totalities with a common regulatory function. Such new totality represents the level of organization that is more powerful than each functional operation involved in its construction or their sum total. The function of regulation makes possible the creation of new and more powerful systemic totalities; it opens up systems by providing a connection between them and other systems in their environment.

There are other important structural operations involved in the process of creation that Piaget discusses in his works. They include equilibration, reflecting abstraction, and the production of disequilibrium. He has also brought up the idea that the maintenance of the balance between equilibrium and disequilibrium is the essential condition for the process of creation. One can find references to these topics already in *The Origins of the Intelligence in Children*. Later Piaget develops these themes in his subsequent specialized studies.[19]

It is beyond the scope of this study to provide a detailed examination of Piaget's theoretical insights that are relevant to the process of creation. In the course of his career he wrote over seventy books and many articles that have enormously expanded our understanding of how human mind works. In one way or another, much of what he has written deals with the process that creates new levels and forms of organization. A brief summary of Piaget's contribution, however, is in order as it will be helpful in understanding the import and significance of Piaget's overall contribution to this subject.

The first, and perhaps the most important point one can make is that Piaget is the first to provide a detailed analysis of the process that leads to the emergence of new levels of organization. Even to this day the Western intellectual tradition has paid relatively little attention to this process. It is certainly not central to paradigms that dominate our civilization. Moreover, the frame of vision through which our civilization generally views reality often excludes the process of creation altogether. Piaget is the first major intellectual figure who grasped the importance of this process and made it the centerpiece of his theoretical contribution. In contrast to many others thinkers who have

---

[18] Jerry Fodor, *The Language of Thought*. New York: Crowell, 1975); Jerry Fodor, *The Mind Doesn't Work That Way: The Scope and Limits of Computational Psychology* (Cambridge: The MIT Press, 2001).

[19] Jean Piaget, *The Equilibration of Cognitive Structures: The Central Problem of Intellectual Development* (Chicago: The University of Chicago Press, 1985); Jean Piaget, *Studies in Reflecting Abstraction* (Hove: Psychology Press, 2001).

dealt with the process of creation, Piaget does not simply emphasize the significance of this process. He provides a detailed analysis of how the process actually works, supported by a great deal of empirical evidence meticulously assembled in experiments.

Piaget's analysis of the process of creation shows that conservation plays a key role in this process; in fact, it forms the basis of this process. The law of conservation is one of the most fundamental laws of nature. It operates throughout the universe. We can observe its workings in distant stars and galaxies, in minute particles of matter, and we can observe it in our biosphere. Piaget's theory relates the process of construction/creation to this most fundamental law.

Conservation requires regulation. We can observe the interplay between conservation and regulation everywhere in nature. Piaget demonstrates that the process of construction that has led to the emergence of human mind also involves the interplay of conservation and regulation. The fact that Piaget relates the process of creation to conservation and regulation—the two processes that are ubiquitous in nature—suggests that this process may have a much wider application than just psychology, cognitive science, and human mind. The focus on the process of construction that Piaget uses so effectively to explain the transition from the biological level of organization to the level of symbolic thought may help explain many other transitions from one level of organization of reality to another that we find throughout nature. Indeed, we find this process at work in the evolution of our entire Universe.

Piaget discusses the emergence of symbolic thought as a transition from one state of the organism as a system to another. A distinct feature of dynamic systems, including symbolic constructions, is operational closure; in other words, they reproduce themselves. Reproduction requires stability. Providing such stability is the function of regulatory mechanism. The better the regulatory mechanism performs its function, the better it handles perturbations, including potential perturbations, the more stable the system is and the better it is conserved.

Regulation is essential for conserving systems. Since regulation coordinates the internal interactions of the subsystems, the level of organization of this global function is much more powerful than that of any of the subsystems it regulates or their sum total. The combinatorial power of regulation transcends the boundaries of the system; it opens up the system and serves as a bridge that connects the system with its environment.

It order to perform its function, regulation also requires stabilization. It stabilizes itself by developing a regulatory mechanism of its own—regulation of regulation. This mechanism emerges in the course of the integration of the level of local interactions with the global level. Such integration requires the construction of the level of organization in which both the level of local interactions and the global level of regulation are but two specific cases; that is, cases that require specific conditions or assumptions. With the construction of this new level of organization that performs the function of regulation of regulation, the system enters a new stage in its evolution. Thus conservation of a system results in constructing new levels of organization. Since there is no reason to suppose that at some level of stabilization the need for conservation will disappear, one must conclude that the construction of new levels of organization is an infinite process.

Since the regulatory mechanism activates the main functional operation by reacting to external stimuli, it is capable of coupling operations it regulates to other operations. The coupling brings individual operations into equilibrium with each other.

The combination of operations is certainly more powerful than each individual operation in the coupling because it has a greater combinatorial power and can respond to a larger number of stimuli. For example, the combination of visual and auditory functions is activated by both visual and auditory stimuli. When infants combine these functions, they begin to "see" when they hear and "hear" when they see.[20] In this case, each function is stimulated not only by the stimuli with which it is directly associated but also by those associated with the other function; each function is activated more often and therefore is better conserved.

Since a coupling of operations has a much greater combinatorial power than each individual operation involved in it, a combination of operations is capable of functioning in an environment that is much richer than the one in which each of them has functioned prior to their coupling. Individual operations retain their identity while conserved in the coupling. The interaction with a new and richer environment leads to differentiation and the emergence of a variety of new derivatives of the coupling. Their conservation requires equilibration and results in the creation of progressively more powerful structures that include many more operational possibilities. A simple example illustrates this point. Two separate operations A and B have only two possibilities each: A and not-A, and B and not-B, for a total of four operations. The combination of these operations offers in addition A and B, not-A and B, A and not-B, and neither A nor B. Thus each operation is capable of four combinations for a total of eight. Conserving these new possibilities will produce new combinations with 16 possibilities that can then grow exponentially to 256 combinations and so on ad infinitum. Among the newly created possibilities there is always one that negates them all—that is, neither A nor B. Such negation is particularly important as it opens the system to totally new possibilities that exist in its environment.

Conservation of operations requires their equilibration. This progressive equilibration constructs more powerful combinations. The emergence of the more powerful level of organization results in a commensurate growth in disequilibrium. Thus, Piaget argues, the conservation of an open dynamic system always involves the production of disequilibrium. In fact, he repeatedly stresses in many of his studies that maintaining the equilibrium between equilibrium and disequilibrium ensures systemic evolution.[21]

As Piaget has also demonstrated in his studies, conservation of systems (for example, mental representations) is a two-pronged process that is orientated both exogenously and endogenously. The exogenous orientation of mental operations, for example, results in connections to mental representations of other individuals; in other words, the need to conserve one's mental operations creates also the need for social interactions and leads to the emergence of sociability. By engaging in social interactions individuals externalize their inner mental representations with the help of language and establish connections between their respective representations. Thus they develop social interactions that help conserve their mental representations. These interactions take the

---

[20] On the coordination of assimilative schemata see, for example, Piaget, *The Origins of Intelligence*, particularly Part II.

[21] For more on equilibrium between equilibrium and disequilibrium, see Gennady Shkliarevsky, "The Paradox of Observing, Autopoiesis, and the Future of Social Sciences." *Systems Research and Behavioral Science*, vol. 24, issue 3 (May-June, 2007), pp. 323-32.

process of construction to the new level—social and cultural. As many thinkers, including particularly Lev Vygotsky (whom Piaget highly respected), have argued, the development of mental structures is intimately related to the development of social relations and culture.[22] The creation of symbolic operations opens infinite possibilities in constructing symbolic systems (linguistic, political, economic, legal, moral and value systems etc.). The need to conserve symbolic structures has led to the rise of human sociability and the subsequent evolution of human society and culture.

Just like the exogenous direction, the endogenous direction also opens infinite possibilities for constructing new levels of organization. Mental operations conserve themselves by connecting to other mental operations. These connections create new combinations of neural networks in the brain. Modern cognitive science fully supports this insight of Piaget. A number of researchers have argued that human creativity "requires the combination of previously unconnected mental representations."[23] When creative thinkers (for example, Einstein, Coleridge, and Poincare) describe how they arrived at the "aha moment" that they experienced, they commonly refer to combinatorial interplay that preceded their creative insight.[24]

Such newly created constructs are essentially global operations that regulate the local interactions that created them. Together local interactions and the global regulatory operations that they create constitute a system. It is essentially a hierarchical structure in which the global regulatory level of organization forms the upper tier and the level of organization of local interactions the lower one. The integration of these two levels is essential for conserving the system. It requires a common frame where the local and the global level are but two specific cases of the more general level of organization; it also involves the encoding of global level operations in terms of the level of local operations. Such encoding results in the emergence of a new level of organization that has sufficient power to integrate both the global regulatory level and the level of local interactions as its particular cases. Piaget calls this procedure reflective abstraction;[25] in modern terminology we call it reflective codification.

A good example of reflective codification is the procedure used by Kurt Gödel, the celebrated Austrian logician and mathematician, in proving his famous theorem of consistency and completeness. In his proof, Gödel devised the way of representing arithmetical formulas in terms of numbers, creating the so-called Gödelian numbers. This procedure integrated the two levels of the axiomatic arithmetical system—numbers and operations in arithmetical formulas—and has proven beyond any doubt that any axiomatic system has true statements (numbers in this case) whose truth cannot be

---

[22] Jean Piaget, *The Moral Judgment of the Child* (New York: The Free Press, 1965); Lev Vygotskii, *Mind in Society: The Development of Higher Psychological Processes* (Cambridge: Harvard University Press, 1978); Lev Vygotsky, "The Problem of the Cultural Development of the Child" (essay published in 1929), http://www.marxists.org/archive/vygotsky/works/1929/cultural_development.htm (accessed Sept.24, 2004).

[23] Paul Thagard and Terrence C. Stewart, "The AHA! Experience: Creativity Through Emergent Binding in Neural Networks," *Cognitive Science*, vol. 35, no. 1 (January 2011), pp. 1–33, p. 1. See also Arthur Koestler, *The Act of Creation* (New York: Dell, 1967) and Margaret Boden, *The creative mind: Myths and mechanisms* (2nd ed.). London: Routledge, 2004).

[24] Sarnoff A. Mednick, "The associate basis of the creative process," *Psychological Review*, vol. 69, no. 3 (1962), pp. 220–232.

[25] Jean Piaget, *Studies in Reflecting Abstraction* (Hove: Psychology Press, 2001).

formally demonstrated using the axioms of the system.[26] It is obvious that the less powerful level of organization cannot demonstrate and justify anything that exists on the more powerful level.

Piaget's theoretical perspective suggests that knowledge is not a reflection of reality, as many have believed and still continue to believe today. Knowledge production—as one-to-one correspondence between our mental constructs and empirical observations--is not even central to our mental activities. It is merely a by-product of the process of creation of new levels and forms of organization performed by our mind. Since mental constructs represent the most powerful forms of organization, we can always establish one-to-one correspondences between them and reality, which explains the phenomenon of underdetermination—that is, cases when several theories can explain the same empirical data. Thus Piaget's theoretical perspective suggests that the key to knowledge production is the creation of new and increasingly more powerful levels of our mental organization. The more powerful they are the more discerning our view of reality is going to be; and the broader and more variegated our view is the more and better we understand reality.

Within this perspective, one can prove that there cannot be in principle any limitations to knowledge production, not just insist that this is so. The question of whether human knowledge has limitations has been the subject of intense debates since the dawn of human civilization. Many have asked the question if there is anything that we humans absolutely cannot know as a matter of principle rather than as a result of a flawed approach. Those who believe that there are some absolute limitations frequently refer to paradox as an example of such limitation.

The existence of paradoxes—that is, statements that are true and false at the same time—puzzles us. Indeed, their existence may suggest that there might be some limit in how much we can know. The theoretical perspective centered on the process of creation shows that paradoxes are not due to some inadequacies or inherent flaws in our nature. On the contrary, the problem is in the very capacity that makes our knowledge possible, in the very fact that we can produce knowledge. Moreover, one conclusion that follows from this theoretical perspective is that the infinite evolution of knowledge is an absolutely essential and necessary consequence of the conservation of our knowledge.

Kurt Gödel has made probably the most important and far-reaching contribution toward our understanding of paradoxes. In his celebrated paper of 1931 that proved to be revolutionary in many ways,[27] Gödel dealt with what was then one of the major problems in mathematics and logic—the problem of consistency. As formulated by the German mathematician David Hilbert the question that Gödel addressed was briefly this: Is it possible to construct an absolute proof of consistency of an axiomatic system based on this system's axioms? That is, is it possible to construct a proof that all true statements in a given system are consistent with its axioms?[28]

In his article Gödel proves in a very ingenious and absolutely incontrovertible way that such proof is in principle impossible. He shows that any deductive system can have sentences that are true, but their truth is indemonstrable; in other words, their truth

---

[26] Ernest Nagel and James R. Newman, *Gödel's Proof* (New York: New York University Press, 1958).
[27] Kurt Gödel, "On Formally Undecidable Propositions of Principia Mathematica and Related Systems" (1931), http://jacqkrol.x10.mx/assets/articles/godel-1931.pdf (accessed May 12, 2011).
[28] Nagel and Newman, *Gödel's Proof*.

cannot be proven within the given set of axioms and rules of inference. Hence, from the perspective of this system, they are not true. In order to demonstrate their truth, one would have to resort to meta-mathematical procedures and create a new and broader axiomatic structure that would be sufficiently powerful to construct such proof. However, even a new structure would still allow a possibility of constructing new sentences that, although true, cannot be proven within this new structure. Gödel shows the inherent limitations of the deductive method that has dominated and continues to dominate our science as one of the principal methods for demonstrating truth and validating our knowledge. Gödel's proof suggests a paradoxical conclusion that is inspiring and frustrating at the same time: although the power of human mind to generate knowledge appears to be infinite, we cannot control this power.[29]

Gödel's proof has interesting implications for understanding the nature of paradox. Gödel shows that within any system of knowledge, or axiomatic cognitive structure,[30] it is possible to construct new knowledge that transcends this structure and therefore cannot be controlled by it. In order to control this knowledge one has to create a new and more powerful structure. In other words, Gödel's proof suggests that paradoxes emerge when two cognitive structures—one more powerful than the other—intersect and the less powerful cognitive structure is perturbed by the emerging more powerful one which is capable of formally proving the controversial truth indemonstrable within the weaker structure. Therefore, an understanding of paradoxes and their function is closely related to the study of cognitive structures and their evolution.

Viewed from the perspective of Piaget's theory, paradoxes are absolutely essential products of the process of creation. The appearance of a paradox signals the emergence of a new and more powerful level of organization. This new level is capable of producing objects and statements that transcend the capacity of the level that preceded it. The latter is simply incapable of justifying the existence of these objects and statements. Yet their existence, or truth, is unmistakable. In other words, these new objects and statements become a source of perturbation for the system that has produced the level of organization that made these objects and statements possible.

The implication of Piaget's theoretical perspective is that paradoxes represent a conflict between the emerging level of organization and the one from which it has emerged. This perspective suggests that the only way to deal with perturbations that create paradoxes is to move boldly forward and embrace the emergent structure; that is, emerge the produced disequilibrium. It also suggests that human knowledge has no limitations, that the solution of problems presented by paradoxes lies in constructing and embracing new levels of mental organization that give rise to new knowledge.

Viewed from this perspective, paradoxes cease to appear as indications of structural limitations of the human capacity to produce knowledge. Rather, they become powerful tools in the production of knowledge. This perspective allows the knower the freedom of critical insight. It suggests that the capacity to inquire into the basis of one's

---

[29] See Ernest Nagel and James R. Newman, *Gödel's Proof*). Gödel himself did not spell out this argument, which raises doubts, for example, about possibility of creating artificial intelligence—one of the rapidly developing areas in modern computer science. However, the fact that Nagel and Newman drew this conclusion shows that it is not unwarranted (Nagel and Newman, *Gödel's Proof*, pp. 100-01).

[30] I define cognitive structure as a set of interrelated cognitive operations—which can be any operation from reflexes to symbolic operations—used for construction of knowledge.

own knowledge is absolutely an essential requirement for establishing control over the process of knowledge production and, consequently, its efficient operation. It suggests further that an understanding of the process of creation will allow us to become masters of our own creativity. By controlling this process we can learn to be creative when we want to, not only when we can. Rather than suffuse, as we often do, the production of knowledge in a futile and wasteful exercise of power, we can turn it into a more efficient, more cooperative, more orderly, and ultimately much more enjoyable process.

Finally, Piaget's theoretical contributions also open a possibility for understanding the nature of consciousness—the problem that to this day remains unresolved. In accordance with Piaget's view of the functioning of human intellect, increasingly complex constructs created by connections among neural networks require regulation. Regulatory operations also need to be stabilized and conserved. Therefore, conservation of our mental operations require constant construction of new and more powerful levels of organization of our neural networks that constitute a hierarchical structure of levels nested in each other. There are no limits that can be set to this structure's growth since we can, and in fact we always must, construct another level of regulation to conserve this structure. We can only conserve it by constructing new and increasingly more powerful levels of our mental organization.

Since regulation is essentially a reflective function, the construction of infinite levels of regulation allows reflection upon reflection; in other words, it allows infinite reflection. So, what does this infinite reflection amount to? What is the phenomenological form in which this capacity for infinite reflection appears?

There is only one form of organization of our mind that allows for reflection upon reflection, or infinite reflection. It is our consciousness. Our consciousness is the mental function that regulates all our mental operations. As a regulatory operation it is capable of reflective coding, or reflecting abstraction in Piaget's terminology. It is the ultimate reflective operation and, as such, it is capable of reflecting on itself. Consciousness is capable of constructing an infinite number of nesting levels of organization where each subsequent level is a reflection on the preceding one. Our consciousness represents this infinite power of construction. There is absolutely nothing (other than the obstacles we erect ourselves) that can prevent consciousness from reflecting on our current mental organization. In fact, we must perform such reflection in order to conserve our mental operations. Thus the endogenous direction of conserving our mental operations leads to the rise of consciousness.

The separation of the two directions—endogenous and exogenous—is merely analytical. From the perspective of the process of construction, there is no inner or outer, no endogenous or exogenous. In fact, many other forms of dualistic oppositions that exist in the Enlightenment tradition disappear when viewed from the perspective of the process of creation.[31] The very conception of the endogenous and exogenous is a product of this process. Within this process, this differentiation does not exist. Both the endogenous and the exogenous direction of conserving mental operations are in fact part of the same process, and they are closely interrelated. They work together, as in fact they must, to conserve our mental operations. Thus the process of infinite creation is a vivid

[31] See, for example, a fuller discussion of dualism in Gennady Shkliarevsky, "Of Cats and Quanta: Paradoxes of Knowing and Knowability of Reality," arXiv:1012.0289 [physics.hist-ph] (December 1, 2010).

proof of the infinity of our universe to which this process contributes. We are part of this universe, and by creating new and more powerful levels of organization we become a source of the creation of infinite number of new forms that constantly emerge in our universe.

The process of creation has several other features that help understand such phenomena as emergence and downward causality—both of which are discussed by modern science but have so far no explanation. In the current literature, emergence is defined as the appearance of new totalities that cannot be reduced to a mere sum of its components. The perspective that focuses on the process of creation shows that the combination of operations offers much broader constructive possibilities. It is more powerful than the mere sum total of the individual operations that compose it; it is a new and much richer totality. In this process of emergence, continuity and discontinuity are not mutually exclusive and do not stand in opposition to each other as they do, for example, in the atomistic approach. The continuous process of equilibration results in what appears to be a discontinuity, or what is often also called "phase transition"—i.e., the creation of new states (totalities) that are qualitatively different from the operations that created them. Linear reductionist logic that we commonly use in our causal explanations cannot establish the connection between the new totality and the level of organization from which it has emerged.

The term "downward causality" that is frequently invoked and observed by quantum physicists.[32] The adaptation of the local level operations to the new and more powerful global level created by their combinations is a good example of such reversal. The construction of new combinations and, as a result, new environments have a profound effect on the local operations that created these combinations. They have to conform to the emerging and more powerful totality that defines them and their new degrees of freedom. Thus the familiar relationship between cause and effect loses its classical linearity as the effect—the new totality—exerts powerful influence on its cause—operations at the local (and less powerful) level of organization.

It is hard to overestimate the importance of Piaget's contributions. The recognition of the importance of the process of construction/creation is perhaps his tmost notable achievement of Piaget—and one that is most relevant to this study. He was the first to make the process of creation the main focus in his view of reality.

Conclusion

As has been emphasized earlier, in organizing our social practice we prioritize equilibration over the production of disequilibrium. The question, however, arises: are we justified in privileging equilibration over the production of disequilibrium and assigning to it the primary role in our social practice and institutions? Humans are capable of creation and have a penchant for creativity. So the work of our mind does not consist exclusively of equilibration and making deductions and inferences. Our mind can

---

[32] John G. Cramer, "The transactional interpretation of quantum mechanics," Reviews of Modern Physics, vol. 58, No. 3 (July 1986), pp. 647-87; see also Mark Bedau, "Downward Causation and the Autonomy of Weak Emergence." *Principia: An International Journal of Epistemology* 6, no. 1 (January 1, 2002): 5–50.

also create, that is, produce disequilibrium. Therefore, our mind is not only about equilibration, deductions and inferences. What is it then that our mind does and that produces disequilibrium? How do we create?

Since our mind can produce both equilibrium and disequilibrium, the two operations must be in some important ways connected. In his important contributions to the study of human mind Jean Piaget has demonstrated the close interrelationship that exists between equilibration and the production of disequilibrium. He has shown that the equilibration of incommensurable operations—for example, hearing and seeing—leads to the emergence of a new and more powerful level of organization that conserves them and their differences as its particular cases and increases their power and degree of freedom.

Piaget has shown that equilibration creates a radical novelty with new properties that have not been observed prior to its emergence. In other words, Piaget demonstrates that equilibration and the production of disequilibrium are closely interrelated aspects of the same process—the process that brings about radical novelty, which is how we understand creation. The dissociation and privileging of equilibration over the production of disequilibrium renders the process of creation incomprehensible, unexplainable, and something akin to a miracle that emerges as if out of nothing.

The privileging of equilibration over the production of disequilibrium has serious consequences for our social practice. For one thing, it prevents us from understanding how the process of creation works. As a result, we cannot control our own creative capacity and we do not see and utilize many possibilities that our creative powers would otherwise offer. Our failure to embrace the process of creation as the central organizing principle of our civilization imposes serious limitations on our social practice and limitations create problems. The next few chapters will look into the connection between some specific problems that our civilization faces and our failure to embrace the process of creation.

CHAPTER THREE

THE PROBLEM OF POLITICAL INSTABILITY: NETWORKS AD HIERARCHIES

Introduction

Political instability is by universal recognition one of the most serious problems in the contemporary world. Over two decades ago, communism collapsed and the Cold War ended. Francis Fukuyama hailed this development in his book *The End of History and the Last Man* as the beginning of a new era in which liberal democracy and capitalism would reign supreme.[1] All that was left for humanity to do, according to Fukuyama, was to enjoy the fruits of this remarkable victory that would bring peace, freedom and prosperity to the entire world.

Long gone are the days of triumphalism. Today, the prophecy that Fukuyama made in the wake of the demise of the Soviet bloc "that liberal democracy, combined with market economics, represented the direction in which the world would inevitably evolve"[2] rings hollow. Today, we hear a very different tune. It warns us about the retreat of democracy, the rise of authoritarian regimes, economic uncertainty and prospects of growing violence and hostility in the world.[3]

At the time of its publication, many welcomed Fukuyama's book as a prophecy--a revelation about the world to come. Now, more than two decades later, few people mention or quote this book, and even fewer hold the predictive powers of its author in high regard. The world has turned out to be very different from what Fukuyama divined. It is turbulent, dangerous and extremely uncertain. Many commentators dismiss the notion that the current conditions are merely a passing storm that will eventually go away; they refer to the contemporary developments in the world as a crisis of civilization. An article in *The Guardian* by Nafeez Ahmed, executive director of the Institute for Policy Research & Development and author of *A User's Guide to the Crisis of Civilisation: And How to Save It*, is a typical example.[4] Ahmed provides a very alarming description of the current state of our civilization. Rather than presiding over a renewed and rejuvenated world, liberal democracy appears to be in retreat. Its economic development has significantly slowed down, its financial system is in disrepair and disrepute, its social fabric ruptured by the growing gap between the rich and the poor and the erosion of the middle class, and its international position and prestige are challenged and even threatened by the rise of new authoritarianism and terrorism.

So how have we come to this? Why have the encouraging prospects of the late 1980s turned into bitter disappointments of the present time? Answers to these questions remain elusive, and not for lack of trying to find answers. This chapter will address only one, arguably the most important aspect of this general turmoil in which we find

---

[1] Francis Fukuyama, *The End of History and the Last Man* (New York: Free Press, 1992).
[2] Francis Fukuyama, "The end of history?" *The National Interest* (Summer 1989), pp. 3–18.
[3] Joshua Kurlantzick, *Democracy in Retreat: The Revolt of the Middle Class and the Worldwide Decline of Representative Government* (New Haven: Yale University Press, 2013).
[4] Nafeez Ahmed, "New age of global unrest in full swing as industrial civilization transitions to post-carbon reality," *The Guardian* (March 1, 2014), http://www.rawstory.com/rs/2014/03/01/new-age-of-global-unrest-in-fullswing-as-industrial-civilization-transitions-to-postcarbon-reality/ (accessed March 3, 2014).

ourselves today: the global political unrest.

The Anti-Hierarchical Nature of the Contemporary Protest Movements

Although the global political unrest started decades ago, it shows no signs of abatement today. The Tiananmen Square protests, the Arab Spring, the color revolutions, Occupy Wall Street and Islamic jihad are all parts of this unrest that has toppled governments, changed regimes and shook the political order in the world to its foundation. It engulfed countries as diverse as Thailand and Greece, USA and Syria, Argentina and Afghanistan, Great Britain and Ukraine. No country seems to be immune to the awesome power of this unrest.

Understanding this phenomenon and finding a solution have been a major preoccupation of many researchers, journalists, pundits and politicians. Although much has been written on this subject, the topic remains contentious with no consensus emerging. For one thing, there is a fundamental difference in the attitudes towards this unrest. Some hail it as a harbinger of a better and more democratic world order,[5] others see it as dangerously utopian and destructive development.[6]

Explanations of the origin of this unrest also differ. Some emphasize poverty, unemployment and disempowerment as the principal motivating factors. They see the poor who are most affected by these adverse conditions as constituting the backbone of these protests. Others point to the critical role played by the middle classes.[7] Paul Mason's book *Why It's Kicking Off Everywhere: The New Global Revolutions* is a good example of the second trend. Written in a journalistic style, the book contains some very interesting insights as to the nature of the unrest and is certainly worth paying attention. Mason sees several factors as influencing the middle class rebellion. One of these factors is the collapse of the neo-liberal economic model. Nothing exemplifies this collapse better than the financial crisis of 2008, the continued sluggishness of the economy and persistently high unemployment figures. The failure of economic recovery has eroded the position of the middle class and caused discontent among its members. The second factor is the revolution in information technology, particularly the expansion of the Internet and other information and communication technologies that have created favorable conditions for mobilization of middle class users. Technological proficiency enables them to create networks that helped to inspire, articulate, coordinate and guide their protest. Finally, Mason attributes considerable significance to what he, among others, sees as a new consciousness that has emerged as a result of engaging with new

---

[5] Paul Mason, *Why It's Kicking Off Everywhere: The New Global Revolutions* (London: Verso Books, 2012); James C. Scott, *Two Cheers for Anarchism: Six Easy Pieces on Autonomy*, *Dignity, and Meaningful Work and Play* (Princeton: Princeton University Press, 2012); Marina Sitrin, *Everyday Revolutions: Horizontalism and Autonomy in Argentina* (London: Zed Books, 2012); David Graeber, *The Democracy Project: A History, a Crisis, a Movement* (New York: Spiegel & Grau, 2013); Paul Mason, *Why It's Still Kicking Off Everywhere: The New Global Revolutions* (London: Verso: 2013); Marina Sitrin, "Goals without demands: the new movements for real democracy," *South Atlantic Quarterly*, vol. 113, no. 2, pp. 245–58.

[6] Joan Roelofs, "Networks and Democracy: It Ain't Necessarily So," *American Behavioral Scientist*, vol. 52, no. 7 (March 2009), pp. 990–1005; Donna L. Chollett, "'Like an Ox Yoke': Challenging the Intrinsic Virtuousness of a Grassroots Social Movement," *Critique of Anthropology*, vol. 31, no. 4 (December 1, 2011), pp. 293–311.

[7] Mason, *Why It's Kicking*; Kurlantzick, *Democracy in Retreat*; Mason, *Why It's Still Kicking*.

technology. For Mason and others, the so-called "networked individual" embodies this new consciousness.[8] Shaped by non-hierarchical network interactions, the new consciousness is inimical to the hierarchies that dominate our world, and the two inevitably come into conflict with each other.

While both interpretations of the causes for the current protest movements offer valuable insights and bring much interesting empirical material into the study of the current global unrest, they overlook some important aspects. In their theoretical perspectives, they attribute much significance to what we often call objective factors; that is, factors that exist independently and largely outside of these movements: social conditions, economic developments, technological changes, and others. While these factors are certainly important, the picture that the current interpretations create misses one very important dimension: subjectivity. It excludes subjective attitudes of the participants. This is not to say that they do not discuss what people say or how they act; of course they do. However, they do not attempt to explain why people think the way they do, why they interpret external facts in the way that they do, and why they see reality in the way that they see it. On the empirical side, the current interpretations pay insufficient attention, if they pay any attention at all, to one most central attitude that characterizes these protests: the pervasive distrust and hostility towards hierarchies—not just the hierarchies that presently dominate the world, but the very principle of hierarchical organization. There is something very visceral in the way that the protesters often relate to hierarchies. This deeply emotional and personal dimension begs explanation.

Whether peaceful and reformist or violent and destructive, all protesters see hierarchies as a threat to what they consider to be true democracy, freedom and equality. They are in principle opposed to all hierarchies and seek to replace them completely or severely limit their power with a broad non-hierarchical approach to organization of public space, hence the name "horizontalists" that has often been used to identify these movements and their ideologies.[9]

One should note that those who constitute hierarchies respond in kind to this attitude of the horizontalists. They also harbor a profound distrust and suspicion towards the horizontalists whom they regard as enemies of order and stability. The attitude on the part of the state towards such horizontalist movements as Occupy Wall Street and Maidan in Ukraine ranges from relatively benign but hostile tolerance and suspiciousness

---

[8] Paul Craven and Barry Wellman, "The network city," *Sociological Inquiry*, vol. 43, issue 3-4 (July 1973), pp. 57–88; Manuel Castells, *The Rise of the Network Society: Information Age*, v. 1 (Cambridge, Mass: Blackwell Publishers, 1996); Paul Mason, "Why it's still kicking off everywhere," *Soundings: A Journal of Politics and Culture*, vol. 53, no. 1 (2013), pp. 44–55.

[9] Murrey Bookchin, *The Ecology of Freedom: The Emergence and Dissolution of Hierarchy* (Montreal; New York: Black Rose Books, 1991; Marina Sitrin, "Horizontalism: from Argentina to Wall Street," *NACLA Report on the Americas*, vol. 44, no. 6 (2011), https://nacla.org/sites/default/files/A04406010_3.pdf (accessed May 12, 2014); Jonathan S. Davies, "Why hierarchy won't go away: understanding the limits of "horizontalism," SSRN Scholarly Paper, 2012 (Rochester, NY: Social Science Research Network) http://papers.ssrn.com/abstract=2066812 (accessed May 21, 2014); Marina Sitrin, "Horizontalism and the Occupy Movement;" Tova Benski, Lauren Langman, Ignacia Perugorría, and Benjamín Tejerina, "From the Streets and Squares to Social Movement Studies: What Have We Learned?" *Current Sociology*, vol. 61, no. 4 (July 1, 2013), pp. 541–61.

to outright enmity and aggression.[10]

The distrust and suspiciousness between hierarchies and networks are not unique to our time. In fact, the entire evolution of human civilization provides many examples of this adversity that nurtured numerous revolutions and uprisings throughout history. Niall Ferguson aptly observes: "Clashes between hierarchies and networks are not new in history; on the contrary, there is a sense in which they are history."[11]

This deep-seated enmity towards hierarchies led at least some researchers to conclude that it reflects something very fundamental in the nature of hierarchical and non-hierarchical interactions. For Max Weber, authority and status were two very distinct features of bureaucratic hierarchies.[12] These features appear to be totally absent in the more flexible, pliant and largely egalitarian structure of networks. Lawrence Tshuma observes in his study of the relationship between government hierarchies and networks: "…bureaucracies and networks stand in stark contrast as polar opposites."[13] More often than not, this opposition translates into tensions and conflicts that hinder and disrupt the evolution of our civilization. Why is this the case? Why in our civilization, in which, many agree, hierarchies emerged out of network connections,[14] are they often at odds with each other?

Networks and Hierarchies: The Phenomenology of the Conflict

The perception that networks and hierarchies are polar opposites contradicts what we know about the relationship between these two types of interactions in systems that exist in nature. Why then is this perception so persistent with regard to human systems, as evidenced in the above quote by Tshuma? Under what conditions do we get such perception?

Systems construct themselves. As has been pointed out, conservation is at the heart of this process.[15] Systems conserve themselves by conserving the functional operations of their subsystems. The more often their functions are activated, the more stable they are and the better they and the entire system are conserved.

As has been made clear before, the survival of any system is impossible without development. In other words, in order to sustain and conserve themselves, systems must

---

[10] Doug Bandow, 'From Iraq to Ukraine, from Syria to Yugoslavia: terrorists who wrecked the modern world a century ago are creating more wars today," *Forbes* (June 30, 2014).

[11] Niall Ferguson, "Networks and hierarchies," *The American Interest* (June, 9 2014), http://www.theamerican-interest.com/articles/2014/06/09/networks-and-hierarchies/ (accessed June 10, 2014).

[12] Max Weber, *Economy and Society: An Outline of an Interpretive Sociology*, vol. 2 (Berkeley, Los Angeles and London: University of California Press, 1978).

[13] Lawrence Tshuma, "Hierarchies and Government Versus Networks and Governance: Competing Regulatory Paradigms in Global Economic Regulation," *Social & Legal Studies*, vol. 9, no. 1 (March 1, 2000), pp 115–42, p. 131.

[14] On the origins of hierarchies, see Benoît Dubreuil, *Human Evolution and the Origins of Hierarchies: The State of Nature* (New York: Cambridge University Press, 2010); on the emergence of hierarchies from networks see B. Trigger, *Understanding Early Civilizations* (Cambridge: Cambridge University Press, 2003); Samuel Bowles S. 2009. "The emergence of inequality and hierarchy: a network explanation," San Francisco, 2009, presentation at the January 2009 meetings of the American Economic Association, tuvalu.santafe.edu/~bowles/NetworkExplanation.pdf (accessed May 14, 2014); and Philip E. Agre, "Hierarchy and history in Simon's 'Architecture of Complexity,'" *Journal of the Learning Sciences*, vol. 12, no. 3 (2003), pp. 413–26.

[15] Gennady Shkliarevsky, "Science and its discontents: is there an end to knowing?" *Systems Research and Behavioral Science*, vol. 30, no. 1, pp. 43–55.

evolve. There is no sustaining without evolution.

The fact that the mechanism of regulation represents a level of organization more powerful than the level of any of the subsystems it regulates or their sum total indicates the presence of hierarchy. In other words, the functioning of networks necessarily leads to the emergence of hierarchies.[16] There is a great deal of evidence that hierarchies and networks are ubiquitous in nature and that, by and large, they are engaged in a cooperative and balanced relationship.[17] One can also occasionally observe such a relationship in human systems. In his insightful article "Does Democracy Inevitably Imply Hierarchy?" William Collins shows that the functioning of democracy necessarily leads to the emergence of hierarchies. Collins concludes his analysis by the following observation:

> Does democracy now imply hierarchy? The answer to this question depends upon how the equilibrium conditions for the model describing a democratic polity are interpreted. If the absence of hierarchy is understood as the emergence of a persistent self-equilibrating harmony among interests, *then the constraints imposed by the sign matrix must be understood as an incipient form of hierarchy*.[18]

Functional and regulatory operations in a system form a hierarchical organization.[19] However, this hierarchical organization does not operate on the basis of command-control. Herbert Simon, for example, emphasized that the presence of hierarchy need not imply top-down relations of authority.[20]

Regulatory operations are a product of the interaction of subsystems. Regulatory function relies, or supervenes, on operations of subsystems. It also regulates and coordinates their activity. Regulation relies on the functioning of the subsystems and, in turn, enhances the subsystems' degrees of freedom. The subsystems adapt to the more powerful regulatory operation, and this adaptation increases their power too. It is not appropriate to describe such mutual dependence of the two levels in this hierarchy as command-control. Rather, one should describe it as cooperative and symbiotic.

Our neural system, including our brain, for example, represents a much more powerful level of organization with a much greater number of degrees of freedom than, for example, that of the level of organization of other organs or cells in our body.

---

[16] William P. Collins, "Does Democracy Inevitably Imply Hierarchy?" *Quality & Quantity*, vol. 20, no. 4 (November 1986), pp. 405-17; M. Copelli, R. M. Zorzenon Dos Santos, and J. S. Sá Martins, "Emergence of Hierarchy on a Network of Complementary Agents," *International Journal of Modern Physics C: Computational Physics & Physical Computation* vol. 13, no. 6 (July 2002), pp. 783-97; Bernat Corominas-Murtra, Joaquín Goñi, Ricard V. Solé, and Carlos Rodríguez-Caso, "On the Origins of Hierarchy in Complex Networks," *Proceedings of the National Academy of Sciences*, vol. 110, no. 33 (August 13, 2013), pp. 13316–21. Collins actually offers a very interesting mathematical examination of the relationship between hierarchies and democracy (Collins, "Does Democracy").

[17] Antoine Danchin, "The tree and the ring: Hierarchical and acentered structures in biology," *The Cancer Journal*, vol. 2, no. 9 (1989), pp. 285-87.

[18] Collins, "Does Democracy Inevitably Imply Hierarchy?" p. 415 (emphasis added).

[19] Aaron Clauset, Christopher Moore, and Mark E. J. Newman, "Structural Inference of Hierarchies in Networks," in *Statistical Network Analysis: Models, Issues, and New Directions*, Proceedings of the 23rd International Conference on Machine Learning, Pittsburgh, PA, 2006 (Springer, 2007), pp. 1-13.

[20] Herbert A. Simon, "The architecture of complexity," *Proceedings of the American Philosophical Society,* vol. 106, no. 6 (1962), pp. 467–82.

However, we cannot characterize the relationship between neural functions and other functions in our organism as command-control. Neurons do not dictate the cells or organs in our body what to do. Rather each side acts in its own capacity. Their cooperative interaction results in the most appropriate selection from the available repertoire of possibilities.[21] Neural functions supervene on physiological functions of the organism and in turn regulate, sustain and thus conserve these functions. We can find many other examples of such symbiotic relationship between adjacent levels of organization in nature.[22] In his epochal article "The Architecture of Complexity," Herbert A. Simon emphasizes that the presence of hierarchies does not necessarily imply a command-control mode of operation.[23] Van Olffen and Romme's article also points to the on-going re-conceptualization of the functioning of hierarchies away from their conception as command-control structures and in the direction of a more balanced structural relationship among different levels in hierarchies.[24]

This symbiotic relationship between hierarchical and non-hierarchical interactions is obtained when we focus centrally on the process of construction. However, let us perform one *Gedankenexperiment*. Let's remove the process of construction from our frame of vision. Let us pretend that we are not conscious of this process, that for us (in the sense of the Kantian 'für sich'), this process does not even exist. How will then reality appear to us?

When we exclude the process of construction, we certainly would not be able to see how the non-hierarchical interactions among subsystems create new levels of organization and new properties and how these new levels conserve what these interactions have created. In other words, we will not be able to see the balanced relationship between hierarchical and non-hierarchical interactions in an evolving system. In fact, the two types of interactions appear to be completely separate and even diametrically opposed to each other. We should not be surprised at this result: after all, we have removed the connection between the two. We have eliminated the frame that brings these two types of interactions together. With the process of construction out of our field of vision, the more powerful level of organization will appear by some kind of supreme design or miracle, as if from nowhere and from nothing, and take control of the system in accordance with this design. There is no way one can understand how this happens without considering the process of construction. It would appear that the operations on this more powerful level of organization simply determine the operations on the less powerful one, that they limit the degrees of freedom of the subsystems (when, in fact, they enhance them). Think for a moment about the symbolic representation of the

---

[21] Danchin, "The Tree and the Ring."

[22] Peter A. Corning, "Synergy and Self-Organization in the Evolution of Complex Systems," *Systems Research*, vol. 12, no. 2 (January 1, 1995), pp. 89–121.
Eva Jablonka and Marion J. Lamb, *Evolution in Four Dimensions* (Cambridge: The MIT Press, 2005).
Leonardo Bich and Luisa Damiano, "On the Emergence of Biology from Chemistry: A Discontinuist Perspective from the Point of View of Stability and Regulation (penultimate manuscript)" (2012), URL: http://www.academia.edu/2047983/On_the_emergence_of_biology_from_chemistry_a_discontinuist_perspective_from_the_point_of_view_of_stability_and_regulation (accessed November 5, 2012).

[23] Simon, "The Architecture of Complexity."

[24] Woody Van Olffen and Georges Romme, "The role of hierarchy in self-organizing systems," *Human Systems Management*, vol. 14 (1995), pp. 199–206, p. 202.

object—mother or toy—in the mind of a child. This representation is capable of triggering both the visual and audio function. If we do not understand how the child combines the two completely incommensurable functions—audio and visual—into one symbolic representation, as Piaget has explained in his *The Origin of Intelligence in Children*,[25] the symbolic representation will appear to us as a miracle, from nowhere, and take command over our two reflex functions. We would not be able to understand how much such symbolic representation enhances the degrees of freedom of these two functions, how the audio function is activated by the visual one and vice versa; moreover, both can be activated by this purely symbolic object even when the real object is not even present.[26] Yet, this is precisely what the major epistemological perspectives that dominate our civilization do: they ignore the process of construction in their approach to reality.

There are two such major perspectives: atomistic and holistic. The atomistic approach is by far the more popular of the two. It seeks to explain the properties of the whole by the properties of its parts; that is, it seeks to explain the properties of a system by the properties of its subsystems. As has been explained elsewhere,[27] such approach is doomed to failure because it tries to explain amore powerful level of organization by a less powerful one, which is impossible. In other words, it does not take into consideration the powerful combinatorial effects of the process of construction. Without understanding this process, atomism simply cannot explain how new properties emerge. As a perspective that prides itself on being the major approach in modern science, atomism essentially explains emergence by modern science-like equivalents of a miracle; for example, chance, random mutations, contingent conditions and circumstances. The Big Bang, quantum mechanics in its present form, the emergence of life forms, the neo-Darwinist evolutionary theory and the non-explanation of the rise of human consciousness—all are products of this approach. Unsurprisingly, these theories ultimately do not explain what they try to explain—the emergence of new levels and forms of organization.

The holistic perspective—the less popular of the two—does not fare much better. It also does not explain the phenomenon of emergence. Like atomism, holism simply accepts newly emerging systems as a given and devotes attention primarily to the way that this whole guides the functioning of its parts. The whole, however, represents a design of unknown provenance. All too often, the holistic approach implies the existence of some higher rationality whose origin remains unexplained and is in principle unexplainable within this perspective.

Despite being diametrically opposed, the two approaches share one important commonality: they both do not include the process of construction into their frame of vision. They represent essentially two sides of the same coin—a simple inversion of each other. As axiomatic principles that organize our knowledge, they represent the same

---

[25] Jean Piaget, *The Origins of Intelligence in Children* (Madison, Conn.: International Universities Press, Inc., 1998).
[26] Piaget, *The Origins of Intelligence in Children*.
[27] Gennady Shkliarevsky, "On Order and Randomness: A View from the Edge of Chaos," April 20, 2011. http://search.arxiv.org:8081/paper.jsp?r=1104.4133&qid=1372596301818mix_nCnN_-392512110&qs=Gennady+Shkliarevsky (accessed March13, 2012); Gennady Shkliarevsky, "Squaring the Circle: In Quest for Sustainability," *Systems Research and Behavioral Science*, vol. 32, issue 6 (2015), pp. 629-45.

level of organization. Neither holism nor atomism can refute each other because they have equal explanatory power that comes from the same level of organization. But, they both become particular cases in the more general perspective that is centrally focused on the process of construction.[28] If we use either the atomistic or holistic approach, we cannot trace the emergence of a more powerful level of organization of reality to the non-hierarchical interactions of its subsystems for a very obvious reason: we exclude the process that constructs this level.

The aforementioned arguments make one point: there is nothing ontological about tensions between networks and hierarchies. On the contrary, in nature, hierarchical and non-hierarchical interactions are generally in balance and complement each other in advancing the evolution of a system. These arguments also show that the failure to include the process of construction into our frame of vision creates the perception that they are ontologically separate and opposed to each other. Finally, as has also been argued, our current perspectives that dominate our civilization indeed exclude the process of construction from their frame of vision. Now, what are then the effects of this exclusion and the resulting perception that networks and hierarchies "stand in stark contrast as opposites"?

Consciousness plays a very important role in our civilization. The way we interpret reality, which in turn depends on the way we approach it, powerfully affects our decisions and shapes the way we act. Therefore, the perception that hierarchical and non-hierarchical interactions "stand in stark contrast as polar opposites,"[29] also affects how we perceive reality and how we act in the social universe.

One general effect of the failure to include the process of construction into our frame of vision is that this exclusion shifts our focus away from the process and towards products of construction. The inevitable result of such shift is the tendency to absolutize and conserve the product—that is, a particular construct—rather than the process. Conservation of the product hinders and disrupts the workings of the process of construction and makes the evolution more difficult and less efficient.

Networks are the single most important source of creativity, but they need hierarchies to conserve their creations. If the two are in conflict and do not cooperate, then hierarchies are deprived of a very important source of creativity, and networks cannot conserve their creation. The result is a deficit of innovation in society and stagnation.

This consideration does not exhaust the range of negative effects that tensions between networks and hierarchies may have. Both hierarchies and networks obey what is, without exaggeration, the most fundamental law that operates in the universe: the law of conservation. If they do not cooperate in the general process of construction that conserves the entire system including networks and hierarchies, they focus exclusively on themselves as the object of conservation. As in any other structure, such conservation takes the form of conservation of functions, which means that they try to incorporate as much of their environment as possible, including other systems, into their functional operations. In other words, they use their environment to activate their functional operations and, thus, conserve them. Because networks and hierarchies constitute a part of each other' s environment, they try to assimilate each other—in other words, they try

[28] See a relevant discussion in Shkliarevsky, "Squaring the Circle," pp. 635-37.
[29] Tshuma, "Hierarchies and Government," p. 131.

to incorporate each other into their own functional operations.

The mode of operation of hierarchies is… hierarchical. Therefore, when hierarchies act to incorporate networks, they do so by trying to subordinate them to their own type of interactions. The effect of such assimilation is the atomization of network agents and destruction of networks. Thus, the assimilation of networks by hierarchies represents an imminent threat to networks' existence, and it comes as no surprise that the latter resist such assimilation. The result is a widening gap and increased tensions between networks and hierarchies.

Network agents conserve themselves by interacting with each other, thus forming networks. Interactions among network agents create new levels and forms of organization. In other words, the functioning of networks creates hierarchies. These newly created hierarchies obviously represent a threat to the hierarchies that are already established in a dominant position. The perception of networks as a direct threat increases the tendency on the part of hierarchies to destroy networks and assimilate their agents into hierarchies.

Thus, without understanding the process of construction, the complex mutual and balanced relationship between hierarchical and non-hierarchical interactions is beyond our grasp. Hierarchies and networks will appear to be ontologically separate and even opposed to each other. Failure to see the need for mutual and balanced relations between the two types of interactions and their perceived opposition to each other will make any cooperation between hierarchies and networks extremely unlikely and often highly improbable. As a consequence, they will not seek to construct mechanisms that will make such cooperation possible. Those who adhere to one type of interactions or the other will try to conserve the mode of interaction they favor—a situation that will create a fertile ground for conflicts. Hierarchies (that is, those who favor this type of interactions) will tend to universalize their prevalent mode of operation and extend it to networks. Efforts to assimilate networks to the hierarchical mode of operation and tie their agents directly to hierarchies will disrupt networks and atomize their agents. Jonathan Davies's empirical analysis, for example, suggests that even a benign intervention of authority "to sustain network compliance with national political agendas . . . paradoxically, tends to undermine networking processes."[30]

There is much empirical evidence that supports the aforementioned arguments. These tensions explain the overall stagnancy and lack of fundamental innovations in our society.[31] We seem to be incapable of resolving the major problems—economic, political, social, environmental and so on—that we as a civilization face today. By universal admission, there is a dire shortage of creative solutions in our society. Even major sciences display the corrosive effects of this disharmony. For example, there have been no major theoretical breakthroughs in physics since the creation of quantum mechanics in the 1930s.[32] Also, we cannot produce a credible solution for our environmental or economic problems.[33]

The antagonistic relationship between networks and hierarchies laden with mutual

---

[30] Jonathan Davies, "Local Governance and the Dialectics of Hierarchy, Market and Network," *Policy Studies*, vol. 26, no. 3/4 (September 2005), pp. 311–35, p. 331.
[31] Niall Ferguson, "America's 'Oh Sh*t!' moment," *Newsweek* (November 7, 2011).
[32] Gennady Shkliarevsky, "Science and its discontents," p. 52.
[33] Shkliarevsky, "Squaring the Circle."

suspicion and hostility is very visible in the politics of authoritarian states where efforts to suppress non-hierarchical civic networks are very common. However, even modern democracies are not immune to the deleterious effects of the separation of hierarchies from networks. They also have not solved this problem but merely ameliorated it. Although the relations between networks and hierarchies in democracies are certainly more flexible and tolerant than in authoritarian states, they are not balanced and are still fraught with conflict. Even in democracies, hierarchies view networks with apprehension, while networks view hierarchies with suspicion and distrust. A good illustration is the attitude towards politicians, political parties and the Washington establishment in general in the United States by broad segments of the American population and, conversely, a hostile attitude towards such broad horizontal movements as Occupy Wall Street by the authorities at various levels of government. Such adversarial, if not antagonistic, relationship is less evident when general conditions are favorable. However, when conditions deteriorate, the adversarial nature of the relations between networks and hierarchies come to the fore.

Tensions and conflicts between hierarchies and networks tend to erode democracy, as hierarchies try to suppress networks and networks try to displace hierarchies. The growing atmosphere of strife, hostility and distrust increases insecurity and the tendency towards the centralization of power. Hierarchies try to intensify their control over society, while networks try to disrupt their effort. The democratic form of government and freedoms begin to gradually lose ground to a more centralized and authoritarian forms of governance.

Indeed, one can observe this dynamics in the actual processes that have been taking place around the world, including the democratic West, from the last decade of the 20th century and into this century. In his book *Democracy in Retreat*, Joshua Kurlantzick documents the worldwide erosion of the democratic form of government, and not just in the parts of the world that have had little experience with democracy, such as countries in Asia or East Central Europe, but also in countries like the United States or in Western Europe that have long been considered strongholds of democratic polity.[34]

Finally, it is also worth noting that in this age of globalization, tensions between hierarchical and non-hierarchical interactions are not limited to individual countries. These tensions transcend national, territorial and even continental boundaries. They straddle many countries and continents. Conflicts between hierarchies and networks in one country or part of the world may effect the erosion of democracy a great distance away. For example, the rise of jihadist movements around the world has triggered the introduction of limitations on democratic freedoms and constraints on individual rights in the United States and other Western democracies.

As this chapter has argued, the hostility towards the dominant hierarchies is what to a very significant degree drives the current political unrest. It has also argued that the root cause of the antagonism between the hierarchies and the contemporary protest movements lies primarily in the way we perceive reality, rather than in the way this reality actually is. More specifically, the perspectives that dominate our civilization do not incorporate the process of construction into their frame of vision. Because the process of construction is excluded, reality appears to us in the form of binaries divided

[34] Joshua Kurlantzick, *Democracy in Retreat*.

by an unbridgeable gap and in a stark and irreconcilable opposition to each other. The perception of the relationship between hierarchical and non-hierarchical interactions conforms to this pattern. They appear to our consciousness as ontologically divided and radically opposed to each other.

Our perceptions powerfully affect the way we act and live our lives. They shape our interpretations of reality that in turn affect our behavior. As a result, the construction of our public space, our political systems, our economic organizations and social institutions embodies this division and thus creates tensions. These tensions adversely affect our civilization and its institutions, making them less efficient in constructing new and more powerful levels of organization. This condition of division hinders the continued evolution of our civilization and creates significant problems in sustaining it.

CHAPTER FOUR

THE PROBLEM OF EXCLUSION, DOMINATION, AND INEQUALITY

Emancipation and Modernity

Few goals have inspired humanity more than emancipation. The conception of what constitutes emancipation has changed many times in the course of human history. Whether breaking the chains of the original sin, crushing the despotism of kings and the church, creating social and political order based on reason, eradicating various forms of class exploitation, or doing away with the gender or racial inequality, emancipation is as inspiring today as it has ever been.

Emancipation—or the elimination of oppression, domination, and inequality—has been a particular preoccupation during the modern period. Rooted in the tradition that began in the age of the Enlightenment, this period has witnessed numerous social upheavals and revolutions in the name of emancipation. There were many ways in which thinkers of the Enlightenment differed from each other. But they all shared one fundamental conviction: they all believed that Reason should play the key role in the way we organize our social and political life. They believed that a rationally organized social and political order would put an end to domination and liberate humanity. In their view, a consistent application of reason would lead humanity into the age of peace, happiness, and prosperity. This conviction was not a concrete and clearly articulated program of action. Rather, it was an expectation that has always been present in the agendas that they pursued. This expectation has eventually been dubbed as the Enlightenment project, or the project of modernity.[1]

The project of emancipation has attracted some of the best minds in our civilization: from Voltaire and Rousseau, to John Stuart Mill and Marx, Foucault and most recently Habermas. Yet the puzzling fact remains that despite numerous attempts to end domination, the solution of the problem of domination continues to be elusive. Domination and inequality are still enduring features of our civilization. The goal of emancipation remains as vital today as it has ever been, if not even more.

Today, as in the past, we hear passionate voices calling for the emancipation of humanity. Many critics of contemporary conditions insist that cosmetic changes will no longer suffice and are reviving the quest for a fundamental reshaping of our civilization.[2]

---

[1] James Schmidt, "What Enlightenment Project?" *Political Theory*, vol. 28, no. 6 (December 2000), pp. 734–57; Henry Steele Commager, *The Empire of Reason: How Europe Imagined and America Realized the Enlightenment* (Garden City, N.Y: Anchor Press/Doubleday, 1977); Matthias Fritsch, "The Enlightenment Promise and Its Remains: Derrida and Benjamin on the Classless Society," *Human Studies*, vol. 25, no. 3 (July 2002), pp. 289–96; Sven-Eric Liedman and Robert Wolker, "The Enlightenment Project and Its Critics," in *The Postmodernist Critique of the Project of Enlightenment*, edited by Sven-Eric Liedman (Amsterdam: Rodopi, 1997); James Schmidt, ed., *What Is Enlightenment?: Eighteenth-Century Answers and Twentieth-Century Questions*. *Philosophical Traditions*, vol. 7 (Berkeley: University of California Press, 1996); Thomas A. Spragens, Jr., "Is the Enlightenment Project Worth Saving?" *Modern Age,* vol. 43, no. 1 (Winter 2001), pp. 49–59.

[2] Jacques Attali, "The Crash of Western Civilization: The Limits of The Market and Democracy," *Foreign Policy*, issue 107 (Summer 1997), pp. 54-64; Luiza Bialasiewicz, "'The Death of the West': Samuel Huntington, Oriana Fallaci and a New 'Moral' Geopolitics of Births and Bodies," *Geopolitics*, vol. 11, no.

As in the past, those concerned with the fate of humanity place their hopes for success on the capacity of human reason to understand reality and transform our civilization in accordance with this understanding. They advance new visions for reorganizing our society in ways that would resolve the current problems. Yet despite many remarkable achievements, the project of the Enlightenment remains unrealized: emancipation still proves to be elusive, while oppression and domination seem to be invincible to all our efforts.

The failure to eliminate oppression and achieve human emancipation will be the subject of discussion in this chapter. It will focus primarily on the Enlightenment tradition for two reasons. First of all, this tradition has dominated and continues to dominate our civilization. Also, the competing anti-Enlightenment theoretical contributions, such as post-modernism or agonistic perspective, largely recognize that the goal of eliminating domination allows only infinite approximation, not solution. Ernesto Laclau and Chantal Mouffet—perhaps the two most prominent representatives of the agonistic perspective—are a good case in point. They recognize that domination is intrinsic to social and political practice and can never be completely eliminated.[3] Therefore, there is no reason to discuss these alternatives to the Enlightenment tradition in relation to the problem of domination and oppression since they recognize that this goal is in principle unattainable. Finally, this chapter devotes a great deal of attention to Jürgen Habermas as, perhapse, the most important contemporary representative of the Enlightenment tradition whose theoretical perspective is in many ways representative of the major strengths and weaknesses of this tradition.

The failure of the Enlightenment project to fulfill its promise has led to a steady stream of criticism that goes back to the 18th century and continues to this day.[4] The calamities of the 20th century have added much fuel to this criticism. Not only have critics argued that the Enlightenment and its successors have been incapable of coping with human frailties and vices, but they have charged that the Enlightenment project itself is a form of domination—the Eurocentric domination over the rest of the world. Post-

---

4 (Winter 2006), pp. 701–24; Amy Chua, "A World on the Edge," *Wilson Quarterly*, vol. 26, no. 4 (September 2002), pp. 62-78; Francis Fukuyama, "America in Decay," *Foreign Affairs*, vol. 93, issue 5 (September/October, 2014), pp. 3-26; Joshua Kurlantzick, "The Great Democracy Meltdown," *New Republic*, vol. 242, issue 8 (June 9, 2011), pp. 12-15; Nafeez Ahmed, "New Age of Global Unrest in Full Swing as Industrial Civilization Transitions to Post-Carbon Reality | The Raw Story," *The Guardian*, March 1, 2014, http://www.rawstory.com/rs/2014/03/01/new-age-of-global-unrest-in-full-swing-as-industrial-civilization-transitions-to-post-carbon-reality/ (accessed March 12, 2014); Joshua Kurlantzick, *Democracy in Retreat*.

[3] Ernesto Laclau and Chantal Mouffe, *Hegemony and Socialist Strategy: Towards a Radical Democratic Politics*, (London: Verso, 2001).

[4] John Martin Gillroy, "Requiem for Modern Politics: The Tragedy of the Enlightenment and the Challenge of the New Millennium," *The American Political Science Review,* vol. 91, no. 4 (December 1997), pp. 948–49; Paul Starobin, "Who Turned Out The Enlightenment?" *National Journal*, vol. 38, issue 30 (July 29, 2006), pp. 20-26; John Gray, *Enlightenment's Wake: Politics and Culture at the Close of the Modern Age* (London: Routledge, 1995); James Schmidt, "What Enlightenment Project?"; Thomas A. Spragens, Jr., "Is the Enlightenment Project Worth Saving?" *Modern Age,* vol. 43, no. 1 (Winter 2001), pp. 49-61; Couze Venn, "The Enlightenment," *Theory, Culture & Society*, vol. 23, no. 2/3 (March 2006), pp. 477–86; Mehmet Atif Ergun, "Modernity: A Myth that Manufactures Consent," *Humanities*, vol. 3, no. 4 (October 27, 2014), pp. 606–23; Halil M. Karaveli, "An Unfulfilled Promise of Enlightenment: Kemalism and Its Liberal Critics," *Turkish Studies,* vol. 11, no. 1 (March 2010), pp. 85–102; Mark Haugaard, "Power and Truth," *European Journal of Social Theory*, vol. 15, no. 1 (February 1, 2012), pp. 73–92.

structuralist and post-modernist opponents of the Enlightenment have been particularly vocal in their criticism and in targeting the pieties of the Age of Reason. They argue that reason is not impartial and autonomous. On the contrary, it totally depends on conditions of domination that control reason and determine what counts and what does not count as knowledge and truth. Michel Foucault, one of the most important post-modern thinkers, has been particularly instrumental in dismantling what he called "the myth of the Enlightenment."

However, nothwithstanding the massive criticism, the Enlightenment project has retained much of its original appeal. The critique of the project has been very productive and garnered a great deal of attention but it has not generated an alternative vision that would be equal in its appeal to the appeal of the Enlightenment project. Despite numerous failures and setbacks to fulfill the Enlightenment ideal, we still continue to believe in reason as a tool of emancipation since we have no means of ensuring our survival and our future other than our reason. And so, the quest for the fulfillment of the promise made centuries ago continues.

Few individuals have been as instrumental in pursuing the dream of emancipation as Jürgen Habermas who has been and remains a towering figure in the intellectual landscape of the contemporary world. By his own admission and the recognition of his numerous supporters and opponents, Habermas is a true heir of the Enlightenment. He has been called a "natural son" of the Enlightenment and "the theoretical heir to Kant's Enlightenment project."[5] Randall Collins has thus summarized Habermas's life-long contribution:

> After the entire 20th century has been eroding such claims from the point of view of relativism, naturalism, subjectivism, or the fragmenting process of analytical sophistication, Habermas steps in to restore the Enlightenment ideal of all-penetrating reason. More than that: Habermas wants to defend, too, the belief in progress, in a world-historical evolution toward the realization of reason in the world.[6]

As many others,[7] Habermas sees domination to be the principal obstacle to the realization of the Enlightenment ideal. As Thomas McCarthey observes in his introduction to *Legitimation Crisis*,[8] the central concern for Habermas is "the self-

---

[5] Miriam Bankovsky, "The Future of Critical Theory between Reason and Power Reply to Amy Allen," *Thesis Eleven*, vol. 120, no. 1 (February 1, 2014), pp. 26–42, p. 31; Christina M. Bellon, "The Politics of Ourselves: Power, Autonomy, and Gender in Contemporary Critical Theory. By Amy Allen," *Metaphilosophy*, vol. 42, no. 3 (April 2011), pp. 340–45, p. 342; Gerhard Wagner and Heinz Zipprian, "Habermas on Power and Rationality," *Sociological Theory*, vol. 7, no. 1 (Spring1989), pp. 102–9.

[6] Randall Collins, "Habermas and the search for reason," *Semiotica*, vol. 64 (1989), pp. 157-169, p. 157, as quoted in Wagner, Gerhard Wagner and Heinz Zipprian, "Habermas on Power and Rationality," p. 103.

[7] Michael Burawoy, "The Roots of Domination: Beyond Bourdieu and Gramsci," *Sociology*, vol. 46, no. 2 (April 1, 2012), pp. 187–206; Lawrence Hamilton, "Power, Domination and Human Needs," *Thesis Eleven*, vol. 119, no. 1 (December 1, 2013), pp. 47–62; Mark Haugaard, "Power and Social Criticism: Reflections on Power, Domination and Legitimacy," *Critical Horizons*, vol. 11, no. 1 (January 2010), pp. 51–74; Vanessa E. Munro, "On Power and Domination: Feminism and the Final Foucault," *European Journal of Political Theory*, vol. 2, no. 1 (January 1, 2003), pp. 79–99; Ian Shapiro, "On Non-Domination," *University of Toronto Law Journal*, vol. 62, no. 3 (Summer 2012), pp. 293–336.

[8] Jürgen Habermas, *Legitimation Crisis* (Boston: Beacon Press, 1975), as quoted in Kahn p. 363.

emancipation of man from the constraints of unnecessary domination in all its forms."[9] In his theoretical perspective, therefore, Habermas seeks to provide a framework in which domination will either be eliminated or significantly diminished and neutralized.

In order to eliminate domination, one has to understand its source. The generally accepted view is that exclusion is the principal source of domination. In his *Madness and Civilization* Foucault, for example, has made a theoretical argument that non-reciprocity is the source of modern domination.[10] In her analysis, Susan Sturm sees domination and discrimination to be the product of structural exclusion:

> Exclusion increasingly results not from an intentional effort to formally exclude, but rather as a byproduct of ongoing interactions shaped by the structures of day-to-day decision-making and workplace relationships. The glass ceiling remains a barrier for women and people of color largely because of patterns of interaction, informal norms, networking, training, mentoring, and evaluation . . . Claims of hostile workplace environment, exclusionary subjective employment practices, and glass ceilings are, by their nature, complex. Their complexity lies in multiple conceptions and causes of harm, the interactive and contextual character of the injury, the blurriness of the boundaries between legitimate and wrongful conduct . . . This complexity resists definition and resolution through across-the-board, relatively specific commands and an after-the-fact enforcement mechanism.[11]

Empirical studies also confirm the role of exclusion in establishing conditions of domination. In her article on separation and exclusion, Mamadi Corra observes that "contemporary research in controlled laboratory experimentation demonstrates the related concept of exclusion as the most efficacious basis of power" and specifically cites "the discovery of exclusion in network exchange experimental research."[12]

For Habermas, exclusion also plays a critical role in establishing conditions of domination. As Kahn observes, for example, one persistent theme in Habermas's oeuvres is that "the state has deeply 'sedimented rules' which, largely through legislative, judicial, and administration regulation and reform, force the exclusion of interests, that is to say, the political articulation of the aims and desires of the whole population, in ways which are not readily apparent."[13] Therefore, determining conditions that constrain exclusion is Habermas's major preoccupation.

---

[9] As quoted in Robbie Pfeufer Kahn, "The Problem of Power in Habermas," *Human Studies*, vol. 11, no. 4 (November 1988), pp. 361–87, p. 363.

[10] Michel Foucault, *Madness and Civilization: A History of Insanity in the Age of Reason* (New York: vintage, 1988).

[11] Susan Sturm, "Second Generation Employment Discrimination: A Structural Approach," *Columbia Law Review*, vol. 101 (April 2001), pp. 458-569, p. 469, as quoted in Archon Fung and Erik Olin Wright, "Countervailing Power in Empowered Participatory Governance," in Archon Fung and Erik Olin Wright, eds., *Deepening Democracy: Institutional Innovations in Empowered Participatory Governance. The Real Utopias Project IV* (London: Verso, 2003), pp. 259-291, pp. 272-73; see also in the same volume Joshua Cohen and Joel Rogers, "Power and Reason," pp. 237–59.

[12] Mamadi Corra, "Separation and Exclusion: Distinctly Modern Conditions of Power?" *The Canadian Journal of Sociology / Cahiers Canadiens de Sociologie*, vol. 30, no. 1 (January 1, 2005), pp. 41–70, pp. 41 and 62.

[13] Habermas, *Legitimation Crisis*, p. 64.

Habermas sees instrumental subject-oriented action as the principal source of exclusion. The logic of this action—or what Habermas calls instrumental or strategic reason—pursues specific particularist goals and interests, and thus by necessity has to be exclusive. Habermas is largely in agreement with his two teachers Adorno and Horkheimer who saw the ascendancy of instrumental rationality in our civilization as the principal impediment of the progress toward emancipation promised by the Enlightenment, resulting in domination, authoritarianism and the self-destruction of the Enlightenment project.[14] However, unlike both Adorno and Horkheimer, Habermas sees a positive solution to the modern predicament. He places his hopes on what he calls "communicative action"—the concept he borrows from Hannah Arendt but considerably rethinks—and communicative reason that embodies its logic.

Unlike strategic action and its corollary, instrumental rationality, communicative reason is orientated toward understanding, rather than towards pursuing subjective interests and realizing particularist goals. Communicative rationality permeates intersubjective relations that populate the domain that Habermas calls the lifeworld, or the public sphere of interactions among equals.[15] It is here, in the lifeworld, that "subjectless forms of communication" enable "rational opinion and political will-formation."[16]

Habermas never speaks about eliminating administrative authority and instrumental rationality. Legitimated by communicative power developed in the lifeworld, they will help to translate the communicative will and opinion into administrative action.[17] In his view, discursive opinion- and will-formation that take place in the lifeworld should constrain the sphere of strategic action and serve as the source of its legitimating.[18] Habermas seeks ways to insulate the sphere of communicative action from any attempts by strategic reason to colonize it. The two spheres should be completely separated "with positive law functioning as the mediator and translator between the two.[19] Thus by creating conditions for unimpeded and unfettered exercise of communicative reason, by securing control of communicative reason and power over other forms of power and rationalities, Habermas seeks to fulfill

---

[14] Adrian Blau, "Rationality and Deliberative Democracy: A Constructive Critique of John Dryzek's Democratic Theory," *Contemporary Political Theory*, vol. 10, issue 1 (2011), pp. 37-57, pp. 41-42.
[15] Douglas Kellner, "Habermas, the Public Sphere, and Democracy: A Critical Intervention, " in Lewis Edwin Hahn, ed., *Perspectives on Habermas* (Chicago: Open Court, 2000), pp. 259-289.
[16] Jürgen Habermas, *Between Facts and Norms: Contributions to a Discourse Theory of Law and Democracy* (Cambridge, MA: MIT Press, 1996), pp. 147 and 486.
[17] Jürgen Habermas, *Legitimation crisis* (Boston: Beacon Press, 1975), p. 87; Kahn, "The Problem of Power in Habermas," p. 381.
[18] Amy Allen, "The Unforced Force of a Better Argument, http://ptw.uchicago.edu/Allen09.pdf (accessed May 14, 2015), p. 4; subsequently published as Allen, Amy, "The Unforced Force of the Better Argument: Reason and Power in Habermas' Political Theory," *Constellations*, vol. 19, no. 3 (September 1, 2012), pp. 353–68; Martin Plot, "Communicative Action's Democratic Deficit: A Critique of Habermas's Contribution to Democratic Theory," *International Journal of Communication*, vol. 3 (2009), pp. 825-52; Gerhard Wagner and Heinz Zipprian, "Habermas on Power and Rationality," *Sociological Theory*, vol. 7, no. 1 (Spring 1989), pp. 102–9; Jürgen Habermas and Thomas McCarthy, "Hannah Arendt's Communications Concept of Power," *Social Research*, vol. 44, no. 1 (April 1, 1977), pp. 3–24; and Jürgen Habermas, *The Theory of Communicative Action: Lifeworld and System. A Critique of Functionalist Reason*.
[19] Allen, "The Unforced Force," p. 10.

the promise of the Enlightenment project—creating social and political order in which human reason would reign supreme.

Needless to say, Habermas's theoretical perspective has attracted a lot of attention. Just critiques, both friendly and not, of various aspects of his work constitute an entire body of literature in its own right. There is hardly an aspect of his thought that has not been meticulously dissected and scrutinized.

Criticisms range widely. Some critics charge that his requirement of the insulation of the lifeworld from the sphere of strategic action is too absolute and that his theoretical foreclosure of the tension between reason and power is not justified.[20] Others criticized his understanding of validity claims.[21] Still others fault him on vilification of perlocutionary action.[22] There are those who conclude that Habermas's conception of communicative rationality is "too restrictive to serve as a model of rational will formation and collaborative decision-making on all but a small scale."[23] Albena Azmanova expresses her reservations about the capacity of Habermas's theoretical approach to make judgments normatively valid and be at the same time relevant to the real world. "[T]he more," she writes, "relevant a theory of judgment attempts to be to the reality of interest- and value-driven political dynamics, the less it lives up to the imperative of normative validity (justice); conversely, the more a model of judgment increases its normative rigor by stipulating procedures and principles, the more it risks being politically unrealistic."[24]

A number of researchers contend that the conditions Habermas sets for practitioners of communicative rationality are "exceptionally demanding."[25] Empirical research, they claim, provides little evidence that human agents possess the kind of psychological characteristics that Habermas's theory requires.[26] Finally, Gerhard Wagner and Heinz Zipprian, question the capacity to make a clear distinction, stipulated by Habermas' theory, between illocution guided by value and perlocution guided by interests and power. "[I]t is possible," they write, "that the efficacy of better arguments that would exercise non-coercive force in the illocutionary realm could actually be produced from the dark sources of de facto relations of power."[27]

---

[20] Allen, "The Unforced Force," particularly pp. 4-5.

[21] Mary G. Dietz, "Working in Half-Truth: Some Premodern Reflections on the Partisanship of Political Speech," paper presented at the Annual Meeting of the American Political Science Association, San Francisco, 29 August–1 September, 1996; Mojca Pajnik, "Feminist Reflections on Habermas's Communicative Action: The Need for an Inclusive Political Theory," *European Journal of Social Theory*, vol. 9, no. 3 (August 1, 2006), pp. 385–404.

[22] Plot, "Communicative Action's Democratic Deficit."

[23] Jean Hillier, "Agonizing over Consensus: Why Habermasian Ideals Cannot be Real," *Planning Theory*, vol. 2, no. 1 (2003), pp. 37–59; Michael Gunder, "Passionate Planning for the Other's Desire: An Agonistic Response to the Dark Side of Planning," *Progress in Planning*, vol. 60, no. 3 (2003), pp. 235-319.

[24] Albena Azmanova, *The Scandal of Reason: A Critical Theory of Political Judgment* (New York: Columbia University Press, 2012) p. 136.

[25] Byron Rienstra and Derek Hook, "Weakening Habermas: The Undoing of Communicative Rationality," *Politikon*, vol. 33, no. 3 (December 1, 2006), pp. 313–39, p. 313.

[26] Rienstra and Hook, "Weakening Habermas," pp. 316 and 328; Daniel Kahneman, "New challenges to the rationality assumption," in Daniel Kahneman and Amos Tversky, eds., *Choices, Values, and Frames* (Cambridge: Cambridge University Press, 2000), p. 774; George A. Quattrone and Amos Tversky, "Contrasting rational and psychological analyses of political choice," in Daniel Kahneman and Amos Tversky, eds., *Choices, Values, and Frames* (Cambridge: Cambridge University Press, 2000).

[27] Wagner and Zipprian, "Habermas on Power," p. 109.

It is beyond the scope of this paper to provide a detailed overview of even major themes in the critique of Habermas, although even this small sample gives an idea about the range and depth of the critical response to his oeuvre. Rather, this paper seeks to address one question: Do the contributions made by Habermas move us closer to the realization of the Enlightenment project? Does it point us in the right direction? These questions are particularly important during this time when, as Shakespeare put it, time is "out of joint." Radical democracy (participative, deliberative, direct, etc.) is one major trend among the solutions proposed for addressing the problems faced by the world today. The radical democracy advocated by Habermas has naturally become attractive for many representatives of this trend.[28]

Habermas and the Paradox of Exclusion

As has been pointed out earlier, like many others Habermas sees domination as the principal obstacle to the realization of the Enlightenment project. And like many others, Habermas also faults exclusion for the continued presence of domination in our world today. So it is quite natural to ask whether Habermas have adequately addressed the problem of exclusion and whether he has found a solution.

At first glance it may seem quite obvious that Habermas with his strong bias for radical democracy and the emphasis on communicative reason will easily pass this test. He makes the realm of communicative action the mainstay of democratic practice. He seeks to provide all the necessary protections for unimpeded and unfettered interactions among equal communicative agents and prevent a colonization of this realm by the logic of administrative power. Finally, he insists on the development of juridical norms and values that will guarantee the translation of communicative opinion and will formation into political practice.

However, on close analysis, his theory reveals a paradox of the lingering subtle and persistent presence of exclusion. One observation that becomes obvious even on first reading is that Habermas predicates his solution to the problem of exclusion on . . . exclusion. He seeks, for example, to exclude strategic reason from the realm of communicative action. This fact has not escaped the attention of several critics.[29] Amy Allen, following on Joel Whitebook's criticism, points out, for example, that "the demand for purity" plagues the structure of Habermas's conception of power. It leads him, according to Allen "to attempt to insulate communicative action and power from the pernicious influence of strategic power"—an attempt that Allen finds "unreasonable and unattainable *even at the conceptual level*."[30]

Habermas's insistence on insulating the sphere of communicative action from strategic reason indicates that he views strategic reason as a diametrical opposite of, indeed a threat to, communicative rationality. The question is: why does he see the relationship between strategic and communicative reason in this way? Or, rather, under

[28] Denise Vitale, "Between Deliberative and Participatory Democracy: A Contribution on Habermas," *Philosophy & Social Criticism*, vol. 32, no. 6 (September 1, 2006), pp. 739–66; Ryan Walter, "Foucault and Radical Deliberative Democracy," *Australian Journal of Political Science*, vol. 43, no. 3 (2008), pp. 531–46; Blau, "Rationality and Deliberative Democracy."
[29] Amy Allen, "The Unforced Force of a Better Argument," p. 4; Plot, "Communicative Action's Democratic Deficit," p. 846.
[30] Amy Allen, "The Unforced Force of a Better Argument," p. 4.

what conditions one will see this relationship as antagonistic?

It is not difficult to recognize in the dichotomy that Habermas constructs between communicative reason, with its orientation toward the object, and strategic reason, which is subject-oriented, the analogy with the traditional subject-object dualism. Indeed Habermas recognizes this fact. As Ciprian Bogdan correctly points out, "the author of the 'communicative turn' in Critical Theory, Habermas emphatically states that intersubjectivity as linguistic interaction provides the answer to the long dispute around subject/object relationship."[31]

The appearance of the subject as completely separate from the object and diametrically opposed to it is possible only if there is a gap between the two. Indeed, this gap is present in Habermas's theoretical perspective. It is foundational, or constitutive of his theory. It is not logically derived from some other proposition, nor is it a product of empirical observation. It is what Kant has defined as synthetic a priori judgment, or self-evident truth. It is an axiomatic organizing principle that Habermas uses to organize his knowledge about social reality. Habermas does not justify the positing of this gap. On the contrary, he uses this axiom to justify all other propositions in his theory. Habermas accepts this axiom uncritically and without proper consideration.

Habermas's acceptance of this axiom is hardly unique. The traditional dualistic approach toward the subject-object relationship has been and still remains prevalent in our civilization. But challenges are not uncommon. As has been indicated earlier, one important challenge came from Jean Piaget. In contrast to Habermas who bases his conclusions on theoretical considerations, Piaget draws his observations from the groundbreaking empirical studies in child development that he conducted over the years.[32] These studies show that the subject and the object are not separate from each other; in fact, they are intimately related: both emerge as a result of the process of construction. This process of construction is the main focus of Piaget's studies. He has forcefully argued, for example, that as the child constructs reality, the child also constructs his/her own mind. As the child's conception of reality changes, so does his/her mental organization. In other words, the two are interconnected. They are two poles of one continuum formed by the process of construction that creates the level of symbolic operations. And, as such, they complement rather than oppose each other.[33]

However, in appropriating Piaget's legacy, Habermas has significantly deviated from the original. As the above shows, he excludes the process of construction from his frame of vision. This exclusion plays a crucial role in his theoretical perspective as it leads to many other forms of exclusion.

According to the theory of communicative action, communication constitutes the basis of social life. It is predicated on the ideals of truth, objectivity, and rationality. These ideals are implicit in formal logical operations that, according to Piaget, are characteristic of the later stages of the child's development.[34] In his discussions of the development of formal logical operations, Piaget has emphasized that they evolve from

---

[31] Ciprian Bogdan, "Intersubjectivity and Techno-Science: Jürgen Habermas," *Journal for Communication and Culture*, vol. 3, no. 1 (Spring 2013), pp. 29–47, p. 29.

[32] See, for example, Jean Piaget, *The Origins of Intelligence in Children*.

[33] For more on Piaget, dualism, and the subject-object relationship see Gennady Shkliarevsky, "Of Cats and Quanta," pp. 20-22, and "Deconstructing the Quantum Debate," pp. 14-18.

[34] Jean Piaget, *The Moral Judgment of the Child*. New York: The Free Press, 1965).

concrete operations that are ultimately rooted in the organism's physiology and biology, that is, in the sphere of unconscious functions of the organism.

Habermas has misappropriated the legacy of Piaget and has given it a logocentric twist. He posits as the initial condition for communication what, for Piaget, is a product of a long evolution. For this reason, Habermas' theoretical endeavor looks like another foundational meta-narrative. Piaget's theoretical perspective hardly lends itself to foundationalism. Foundational meta-narratives are characterized by an epistemological approach that is predicated on a transcendent position of the observer and precludes a critical stance toward his or her own act of observing. The position of the observer lies entirely outside the plane of interpretation, which makes impossible to observe the observing and, therefore, have an objective view. Habermas, for example, does not explain his foundational proposition regarding the possibility of communication. By contrast, Piaget makes no such foundational claims. According to his theory, there is no foundational moment, for example, in the rise of consciousness; it gradually emerges from sensory-motor operations that in turn have their origin in physiological functions and biology of the organism.[35] Piaget shows that consciousness and reason have their roots in the processes of conservation and regulation of the biological functions of the organism and hence in the sphere of the irrational and unconscious.

This misappropriation of Piaget by Habermas is particularly interesting, since in his philosophical and sociological views Habermas have been strongly influenced by the theoretical legacy of Jean Piaget. In his essay "Toward a Reconstruction of Historical Materialism," for example, Habermas recognizes his debt to the father of genetic epistemology when he writes: "Only the genetic structuralism worked out by Piaget, which investigates the developmental logic behind the process in which structures are formed, builds a bridge to historical materialism."[36]

According to the theory of communicative action, communication constitutes the basis of social life. It is predicated on the ideals of truth, objectivity and rationality. These ideals are implicit in formal logical operations that, according to Piaget, are characteristic of the later stages of the child's development.[37]

In his discussions of the development of formal logical operations, Piaget has emphasized that they evolve from concrete operations that are ultimately rooted in the organism's physiology and biology, i.e. in the sphere of unconscious functions of the organism. It is not clear why Habermas has chosen to make changes in this sequence and regard as the fundamental condition for communication, and hence social life, what Piaget considers a product of a long evolution which involves social interactions.

Habermas's position is essentially logocentric, which opens his theory to criticism. For example, Niklas Luhmann has challenged Habermas's rationalist approach to communication.[38] Axel Honneth also notes the negative effects of Habermas' logocentric focus that blinds him to the importance of non-linguistic experiences of disrespect, humiliation and social shame. Subjective, inchoate, and unrecognized as they may be, these experiences are capable of having a profound effect on intersubjective

---

[35] Jean Piaget, *Biology and Knowledge: An Essay on the Relations between Organic Regulations and Cognitive Processes* (Chicago: The University of Chicago Press, 1971).
[36] Jürgen Habermas, *Communication and the Evolution of Society* (Boston: Beacon Press, 1979), p. 169.
[37] Jean Piaget, *The Moral Judgment of the Child* (New York: The Free Press, 1965).
[38] Eva Knodt, "Forward" in Niklas Luhmann, *Social Systems* (Stanford: Stanford University Press, 1995).

relationships.[39] Others have charged that his theory represents just another foundational meta-narrative which is logo- and Eurocentric.[40] The emphasis on the exceptional role of communicative reason clearly underrates the role of the irrational in human sociability and certainly amounts to another instance of exclusion.

The dualism in Habermas's theoretical perspective is an inevitable result of his failure to embrace the process of creation discussed by Piaget. The view of the relationship between the subject and the object as antagonistic sets the subject-oriented action in opposition to the action oriented toward the object, or, to use Habermas's terminology, instrumental/strategic reason against communicative rationality.

According to Habermas, communicative action is absolutely essential for the realization of the Enlightenment project. But in order to play its role, the sphere of communicative action should be well insulated from the corrosive influence of strategic reason. As a result, Habermas seeks to exclude subject-oriented strategic reason from the sphere of communicative action—an effort many researchers find untenable. Amy Allen, following on Joel Whitebook's criticism, points out, for example, that "the demand for purity" is "unreasonable and unattainable *even at the conceptual level*."[41]

Martin Plot also finds Habermas's approach toward strategic reason to be exclusionary.[42] In his view, Habermas's "vilification of perlocutionary action" is unjustified. Using Hannah Arendt notion of power and action, Plot persuasively argues that instrumental and communicative reason do not have to be opposed to each other the way Habermas makes them appear to be and that they can productively "intertwine in political action proper, as exemplified in Hannah Arendt's notion of [democratic] action."[43] He concludes that the normative standard for communicative action established by Habermas "is not only unrealistic but simply undesirable from the point of view of a post-theological democratic theory."[44] Adrian Blau similarly criticizes Habermas's view of instrumental reason and argues for a more differentiated approach. It is one thing," he writes, "that some applications of instrumental rationality—some means or some ends—repress individuals. It is quite another thing to say that instrumental rationality does so."[45] In fact, Blau sees, on one hand, that "discursive democracy is more instrumentally rational than [even] elitist politics," and on the other, that "[d]iscursive democracy needs instrumental rationality."[46]

---

[39] Miriam Bankovsky, "The Future of Critical Theory: Between Reason and Power. Reply to Amy Allen," *Thesis Eleven*, vol. 120, no. 1 (February 1, 2014), pp. 26–42, p. 38; Axel Honneth and Miriam Bankovsky, "The relevance of contemporary French philosophy for a theory of recognition: An interview," in Miriam Bankovsky and Alice Le Goff, eds., *Recognition Theory and Contemporary French Moral and Political Philosophy* (Manchester: Manchester University Press, 2012), pp. 23–38; Jean-Philippe Deranty, *Beyond Communication: A Critical Study of Axel Honneth's Social Philosophy* (Leiden: Brill, 2009); Marie Garrau, "Between gender and subjectivity: Iris Marion Young on the phenomenology of lived experience," in Miriam Bankovsky and Alice Le Goff, eds., *Recognition Theory and Contemporary French Moral and Political Philosophy* (Manchester: Manchester University Press, 2012), pp. 127-40.

[40] Gerard Delanty, "Habermas and Occidental Rationalism: The Politics of Identity, Social Learning, and the Cultural Limits of Moral Universalism," *Sociological Theory*, vol. 15, issue 1 (1997), pp. 30-59.

[41] Amy Allen, "The Unforced Force of a Better Argument, p. 4.

[42] Martin Plot, "Communicative Action's Democratic Deficit," p. 846.

[43] Plot, "Communicative Action's Democratic Deficit," p. 825.

[44] Plot, "Communicative Action's Democratic Deficit," p. 839.

[45] Blau, "Rationality and Deliberative Democracy," p. 6.

[46] Blau, "Rationality and Deliberative Democracy," p. 2.

The exceptional importance that Habermas attributes to rational consensus puts the emphasis on commonalities at the expense of differences. Despite his acknowledgement of race, class, gender, and minorities issues for constituting more equal and autonomous relations, Habermas tends to downplay if not outright diminish their role in the sphere of communicative action. Many feminists, for example, criticized Habermas for paying too little attention to gender differences.[47] Jean Cohen, an observer undoubtedly sympathetic to Habermas, reproached him for his "peculiar blindness to gender issues."[48] Many researchers have expressed their skepticism about Habermas's "confidence in abstract reason" as a one-fits-all cure to address social and political issues particularly relevant to gender, race, and ethnicity.[49] There is, however, very little that Habermas offers to dispel this skepticism.[50] He is hardly oblivious to the fact of these exclusions from his analysis but insists that they can only be discussed in "the light of declared standards [of communicative reason]," thus reducing them to precisely the abstract rationality that the proponents of these issues criticize and doubt. According to Habermas, one can assess the oppression of ethnic, cultural, gender, and other groups only "in the light of this one basic standard."[51]

According to Habermas, the adoption of communicative attitude should serve the purpose of producing consensus based on "criticizable validity claims." Reaching consensus requires the emphasis on commonalities and the suppression or exclusion of differences. Commonalities, as useful as they may be in maintaining social stability, generate stasis. Differences, by contrast, are very productive and play an important role in enriching our life and producing new levels of organization of reality. The suppression and exclusion of differences--again, voluntary or not--will certainly constrain our creative capacity and the pace of progress.

---

[47] Mojca Pajnik, "Feminist Reflections on Habermas's Communicative Action: The Need for an Inclusive Political Theory," *European Journal of Social Theory*, vol. 9, no. 3 (August 1, 2006), pp. 385–404; Mary G. Dietz, "Working in Half-Truth: Some Premodern Reflections on the Partisanship of Political Speech," paper presented at the Annual Meeting of the American Political Science Association, San Francisco, 29 August–1 September, 1996.

[48] Jean L. Cohen, "Critical Social Theory and Feminist Critiques: The Debate with Jürgen Habermas," in Johanna Meehan, ed., *Feminists Read Habermas: Gendering the Subject of Discourse* (New York: Routledge, 1995), p. 57.

[49] Bent Flyvbjerg, "Ideal Theory, Real Rationality: Habermas Versus Foucault and Nietzsche," SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, April 1, 2000), p. 12; see also Mary P. Ryan, "Gender and Public Access: Women's Politics in Nineteenth-Century America," in Craig J. Calhoun, ed., *Habermas and the Public Sphere* (Cambridge, MA: The MIT Press, 1992), pp. 259-89, p. 262; Nancy Fraser, "What's Critical About Critical Theory? The Case of Habermas and Gender," in Seyla Benhabib and Drucilla Cornell, eds., *Feminism as Critique: Essays on the Politics of Gender in Late-Capitalist Society* (London: John Wiley & Sons, 1991); Geoff Eley, "Nations, Publics, and Political Cultures: Placing Habermas in the Nineteenth Century," in Craig Calhoun, ed., *Habermas and the Public Sphere* (Cambridge, MA: MIT Press, 1992); Lorenzo C. Simpson, "On Habermas and Particularity: Is There Room for Race and Gender on the Glassy Plains of Ideal Discourse?" *Praxis International*, vol. 6, no. 3, 1986; Allen, Amy. "The Unforced Force of the Better Argument: Reason and Power in Habermas' Political Theory." *Constellations*, vol. 19, no. 3 (September 1, 2012), pp. 353–68.

[50] Flyvbjerg cites a characteristic episode at a conference on the occasion of the publication of the English translation of *The Structural Transformation of the Public Sphere* when Nancy Fraser asked Habermas if the basic condition for communicative rationality was not a utopian society with "economic equality—the end of class structure and the end of gender inequality." Habermas essentially avoided answering this question (Flyvbjerg, "Ideal Theory," p. 12).

[51] Jürgen Habermas, "Concluding Remarks," in Calhoun, ed., *Habermas and the Public Sphere*, pp. 466-67.

The exclusion of the gender, race, ethnicity and minority issues is indicative of a more general tendency to exclude social power—the power of money, connections, and privilege—from the list of potential threats in Habermas's idealized view of the communicative sphere. Amy Allen has provided a detailed analysis of this tendency in her essay "The Unforced Force of the Better Argument: Reason and Power in Habermas' Political Theory."[52] She concludes that given "the pervasiveness, depth, and systematicity of asymmetrical social power relations—along lines of class, gender, race, and sexuality, for example—and given the ways in which such power relations are constitutive of the identities of their targets," Habermas's expectation of blocking the communicative sphere from the asymmetries of strategic social power as unrealistic, to say the least.[53]

One cannot omit from this rather long list of exclusions that Habermas brings into his theory, the exclusion that one may find especially disconcerting. This particular form of exclusion has to do with the stringent conditions that Habermas imposes on his communicative agents. According to Habermas, those who act in the communicative sphere must possess a special attitude and a number of competences required to produce rational understanding and consensus. First and foremost, they should adopt the communicative attitude, that is, they must abandon their orientation toward the subject:

> [C]ommunicative rationality carries with it connotation based ultimately on the central experience of the unconstrained, unifying, consensus-bringing force of argumentative speech, in which different participants *overcome their merely subjective views* and, owing to the mutuality of rationally motivated conviction, assure themselves of both the unity of the objective world and the intersubjectivity of their lifeworld.[54]

Communicative agents, according to Habermas, have a responsibility to "behave rationally." "[O]nly those persons," he writes, "count as responsible who, as members of a communication community, can orient their actions to intersubjectively recognized validity claims."[55]

Habermas recognizes the stringency of the demands that he articulates. "My position," he writes, "is that those who understand themselves as taking part in argumentation mutually suppose, on the basis of the pre-theoretical knowledge of their communicative competence, that the actual speech situation fulfils certain, in fact quite demanding, preconditions."[56] But it is only if these conditions and demands are fulfilled that the lifeworld "would gain a singular transparence, inasmuch as it would allow only for situations in which adult actors distinguished between success oriented and understanding-oriented actions just as clearly as between empirically motivated attitudes and rationally motivated yes/no positions."[57]

---

[52] Amy Allen, "The Unforced Force of the Better Argument."
[53] Allen, "The Unforced Force," p. 18.
[54] Jürgen Habermas, *The Theory of Communicative Action, Volume 1: Reason and the Rationalization of Society* (Boston: Beacon Press, 1984), p. 10 (emphasis added).
[55] Habermas, *The Theory of Communicative Action*, p. 14.
[56] Jürgen Habermas (1991). "A reply," in Axel Honneth and Hans Joas, eds., *Communicative Action* (Cambridge: Polity Press, 1991), p. 255; Rienstra and Hook, "Weakening Habermas," p. 311.
[57] Jürgen Habermas, *The Theory of Communicative Action: Lifeworld and System: A Critique of Functionalist Reason*, vol. 2 (Boston: Beacon press, 1985), p. 145.

The requirement to adopt a special kind of attitude, acquire particular competences, and "overcome" subjectivity certainly appears as a limitation imposed on the individual. This constraint on free expression creates a problem with regard to the freedom of the individual to which Habermas remains strongly committed. Habermas, however, deftly resolves this problem by emphasizing the voluntary nature of these requirements. According to Habermas, individuals of their own free will subordinate themselves to what Habermas defines as the "unforced force of the better argument."[58]

The idea of a voluntary renunciation of one's own subjectivity is vulnerable on two counts: theoretical and empirical. The self is a product of our construction. The process that we use in constructing reality around us also constructs our self. Therefore, any changes that take place in our mental operations also necessarily lead to changes in the way we see or approach reality. Consequently, any attempt to suppress or limit our own self, voluntarily or not, must constrain our understanding of reality. Can we impose such constraint on ourselves? Can we undo what we have already constructed? Can we unlearn what we have already learned?

The obvious answer to these questions is "no, it is impossible." Therefore, a voluntary or involuntary adoption of a limiting constraint on our self is incapable of limiting anything. The self is unlikely to be affected even if we decide to adopt this attitude. It will simply be foreclosed, bracketed, and forced underground, to use Dostoevsky's potent metaphor. Such voluntary bracketing will simply remove the self from our radar of conscious control, which will merely render the self uncontrollable. The self is likely to reemerge with vengeance and all the arrogance of righteousness for making an effort to deny itself.

The psychological qualities and discursive competencies that Habermas requires for his communicative agents are extremely demanding. Many practitioners who have witnessed real deliberative forums have to acknowledge that the Habermassian communicative agent is a far cry from real participants in such events. Numerous empirical studies in psychology, politics, democratic theory and practice, and other cognate areas lead to one inevitable conclusion. They show that

> . . . compelling evidence that the maintenance of coherent beliefs and preferences [that Habermas's theory stipulates] is too demanding a task for limited minds. Limited minds are exactly what human agents possess . . . Quite simply, Habermas is reliant on agents who, while explicable in theoretic terms, are practically unavailable in psychological terms.[59]

This and similar conclusions suggest that many real people do not fit the image of a communicative agent that Habermas has conjured. Therefore, there is a very

---

[58] This solution reminds one of the way that Fedor Dostoevsky resolves the problem of human freedom. He also insists on the voluntary submission to God's truth (Brothers Karamazov, "The Legend of Grand Inquisitor").

[59] Rienstra and Hook, "Weakening Habermas," pp. 316 and 328; Daniel Kahneman, "New challenges to the rationality assumption," in Daniel Kahneman and Amos Tversky, eds., *Choices, Values, and Frames* (Cambridge: Cambridge University Press, 2000), p. 774; George A. Quattrone and Amos Tversky, "Contrasting rational and psychological analyses of political choice," in Daniel Kahneman and Amos Tversky, eds., *Choices, Values, and Frames* (Cambridge: Cambridge University Press, 2000).

real possibility that a large number of individuals will have to be excluded from the communicative sphere.

As Habermas himself has recognized, exclusion is the source of domination. The above discussion shows that Habermas's theory presupposes not one but a number of exclusions: the exclusion of the process of creation from his frame of vision, the exclusion of the irrational and the subjective from the communicative sphere, the exclusion of instrumental reason and strategic power from the lifeworld, the exclusion of differences and social power, and finally the exclusion of many real people who may not qualify to graduate as Habermassian communicative agents. As many, including Habermas, believe, exclusions do not solve problems; they merely force them underground from where they manifest themselves in some distorted and perverted form. Habermas's exclusions are no exception, and like any other exclusion they must create an opening for domination. As noble as Habermas's intentions are in completing the project of modernity, the preceding analysis indicates that the path he charts is unlikely to meet these expectations precisely on the terms that Habermas himself accepts as necessary.

Habermas's failure to resolve the problem of exclusion and domination is in many ways symptomatic of a broader issue. It is not merely his personal failure. Rather the reason is characteristic for the entire Enlightenment tradition that continues to dominate our civilization. As this chapter has shown, the reason is due to the fact that this tradition excludes the process of creation from its frame of vision. The focus on Habermas—one of the most important and vocal contemporary advocates of human emancipation—and his failure to resolve the problem of exclusion and domination illustrates the failure of the entire tradition to which Habermas belongs and which he so brilliantly represents. Indeed, Habermas is just one thinker in this tradition, albeit a very prominent one. Yet his case illustrates the reasons why exclusion, domination, and inequality are so adaptable and successfully resist all attempts to eradicate them.

CHAPTER FIVE

THE PROBLEM OF VIOLENCE

Few problems in the world today cause as much agony and pain as the problem of violence. Whether it is the violence of terrorism or organized warfare, violence in the streets or even some "civilized" forms of violence exercised by the state—in all its forms violence retains its brutal and inhuman core. Our civilization unequivocally condemns violence, yet violence has been and remains a pervasive presence in our world.

The elimination of violence has been at the heart of the Enlightenment project. This project is ultimately not about a rigid set of doctrines or policies. More than anything else, it is about a promise and a commitment to human reason. In the minds of those who have framed and shaped this project, the rule of reason is the only path toward liberation. The elimination of violence is certainly a part of this promise. According to the framers of the Enlightenment project, the world renewed by the salutary rule of reason will know no violence, no fanaticism, no tyranny, and no war. There will be no oppressors and oppressed, no victims and victimizers.

Such is the promise that the West has extended to the rest of the world. There have been moments in history when the fulfillment of this promise seemed close at hand. The most recent one occurred at the end of the twentieth century when communism collapsed and the Cold War ended. At the time many believed that we were on the threshold of an era of peace, prosperity, and the dominance of liberal democracy throughout the world. Some even hazarded to proclaim that history had finally reached its end.[1] Yet this moment did not last very long.

Subsequent developments have proven such predictions to be an illusion, a dream of wishful thinkers that had nothing to do with the real world. The attack on the World Trade Center on September 11, 2001, was a rude awakening from the self-congratulatory complacency into which our civilization lulled itself. It has revealed how deeply divided the world is and what powerful destructive and violent forces are at work. Ever since the events of 9/11 no one has had any doubts that we continue to live in a dangerous, uncertain, and utterly unpredictable world, and that the fulfillment of the Enlightenment promise remains as distant as it has ever been. In what we hear today from politicians and pundits, religious leaders and public figures, and even common citizens one can sense the same unsettling and troubling questions: Will the world survive? Will our children have a future? Will the promise made several centuries ago ever be fulfilled? Will reason, rather than violence, prevail in our world?

Since the dawn of the modern era, our civilization has viewed reason as a dynamic property of the human mind that is capable of organizing reality and developing it in ways that are beneficial to the human race. Much of the project of modernity is about the affirmation, validation, and realization of what it sees as the infinite potential of human reason. The elimination of violence is one of the most important goals that the rule of reason is supposed to achieve. Many have believed, and continue to believe, that rational human agents guided by reason should be able to find ways of resolving conflicts without resorting to violent, destructive, and brutal forms of behavior. They cherish the

[1] Francis Fukuyama, *The End of History and the Last Man* (New York: The Free Press, 1992).

hope that wars can become obsolete and violence will have no place in human interactions.

No one sees the project of modernity as a one-time deal with a clearly identifiable set of goals. Rather, most view it as an on-going process with constantly expanding horizons. However, this view does not mean that as the project evolves, its goals and promises will constantly receded into a distant future. On the contrary, the project of modernity is about setting rational goals and achieving them. In contrast with otherworldly promises of religion, much of the appeal of the project of modernity rests on its practicality, realism, and the expectation of success. In fact, the very spirit of rationality and empirical proof—characteristic for the project of modernity—implies that those who embrace this project measure its success by the attainment of its goals.

It has become commonplace to critique the project of modernity. Numerous detractors have disparaged the Enlightenment tradition for its insensitivity to the plight of the poor and underprivileged, its unrestrained search for gratification, for the ravages of merciless exploitation of people and nature, for its acceptance of the oppression of women and ethnic minorities, for its racial inequality, its imperialist expansionism and indignity of colonial domination, its disregard for human rights, and for religious intolerance. Many have expressed doubts about its overall direction and prospects for success. The skepticism of post-modernism regarding the capacity of reason to understand reality has gained substantial support in intellectual circles. Even devoted advocates of modernity have expressed doubts about a possibility of its success. In his contribution "Modernity: An Unfinished Project" Jürgen Habermas, one of the most important modern thinkers in the Enlightenment tradition, concludes that the prospects for the fulfillment of the Enlightenment promise "are not very encouraging."[2]

Few concerns about the Enlightenment tradition attract more attention than the continued survival of violence. More than two centuries separate us from the time when Immanuel Kant reflected on the capacity of reason to create eternal peace, and they have seen violence on an industrial scale. The great French revolution surrendered the ideals of liberty and inviolability of rights to the violence of the Terror and the Napoleonic wars. The revolutions of the 19th and 20th century, colonialism and nationalism have also claimed their share of brutality and barbarity. The massive slaughter in the two world wars during the 20th century with the extermination of six million Jews under the Nazis shocked even those who were not oblivious to man's capacity for evil. Even the triumphant moment of liberal democracy that followed the end of the Cold War and the collapse of Soviet communism was marked by numerous outbursts of savagery and barbarism all across Europe and the world.

Such is the visible record of the period that has experienced an unprecedented growth of material wealth and technological power. But there has also been insidious forms of violence that went unrecorded and unpublicized—violence that has been difficult to track or document: the violence towards women, domestic violence, child abuse, lynching, gay bashing, and even more subtle and insidious forms of violence—such as psychological, verbal, or symbolic—that ruined lives and careers, and left indelible scars on individual and collective psyche.

---

[2] Jürgen Habermas, "Modernity: An Unfinished Project," in Maurizio Passerin d'Entrèves and Seyla Benhabib, eds., *Habermas and the Unfinished Project of Modernity* (Cambridge, Mass: MIT Press, 1997), 38-55, pp. 54-55.

One would certainly be in remiss to see the modern period exclusively in terms of violence and destruction. In his well-publicized book *The Better Angels of Our Nature: Why Violence Has Declined* that has generated a great deal of controversy, Steven Pinker, a Harvard psychologist, has marshaled a great deal of empirical evidence to prove that despite all the wars and destruction, the current exposure to violence is significantly less severe that it was several hundred years ago, to say nothing about several millennia.[3] Pinker has no illusions about the human race. He sees humans as equally predisposed to both conflict and cooperation by the evolutionary hard wiring of our brain. However, he also emphasizes what he sees as an encouraging influence of the "civilizing process"—the term he borrows from Norbert Elias. In Pinker's view the improved material circumstances of human existence and the ameliorating cultural attitudes have significantly diminished the level of violence in the modern world in comparison with the preceding periods.

Pinker's statistics and arguments are not universally accepted. Some feel that statistics may be misleading in assessing the level of violence in the modern world. The declining percentages conceal much greater absolute numbers. The statistical odds may mean little for those who still lose their life to violence today. There is also no guarantee that the relatively peaceful period that we have experienced since World War II will not end in a new cataclysm. Some of the aspects of the civilizing process cited positively by Pinker may appear to be a dubious blessing. For example, the monopolization of violence by the state may diminish the level of violence among individuals, but it certainly preserves violence as a tool of the state vis-à-vis its citizens. The irony has not escaped Elizabeth Kolbert who in her review of Pinker's book cites Churchill's remark: "It may well be that we shall by a process of sublime irony have reached a stage in this story where safety will be the sturdy child of terror, and survival the twin brother of annihilation."[4]

Dan Stone also observes that violence "need not involve the relation of individuals; the state is just as capable of treating the 'object of violence' as one 'potentially worthy of bodily harm, or even annihilation.'"[5] In his review of Pinker's book in *The Christian Science Monitor* Jordan Smith argues:

> As a proportion of the world's population, or even just Norway's, the sixty-nine casualties on Utøya hardly register. By Pinker's method of accounting, they received far too much coverage; in an average year in Norway, some three hundred people die from accidental poisoning. But the shootings illustrate in nightmare fashion what we all know to be the case. Hate and madness and cruelty haven't disappeared, and they aren't going to. Systems break down and, worse still, can be subverted. This is one of the lessons of Auschwitz, and it's why, since 1945, most people have hesitated to argue that modernity and violence are opposed . . . The demons may yet return.[6]

---

[3] Steven Pinker, *The Better Angels of Our Nature: Why Violence Has Declined* (New York: Viking, 2011).
[4] Elizabeth Kolbert, "Peace in Our Time," *New Yorker*, vol. 87, no. 30 (October 3, 2011), pp. 75-78.
[5] Dan Stone, "Modernity and Violence: theoretical reflections on the Einsatzgruppen," *Journal of Genocide Research*, vol. 1, no. 3 (1999), pp. 367-378, p. 374.
[6] Jordan Michael Smith, "The Better Angels of Our Nature: Why Violence Has Declined," *Christian Science Monitor* (October 20, 2011).

There is no need to enter the fray over Pinker's book. Both Pinker and his critics agree that the level of violence in contemporary society still remains prohibitively high and that violence and the civilizing process have proven to be compatible if not agreeable companions. The question is: Why do they coexist? What makes their coexistence possible? Will the civilizing process ever be able to get rid of violence and deliver on the promise of modernity?

The persistence of violence under modern conditions is an enigma that continues to baffle researchers. Explanations of this persistence vary widely: from the emphasis on biology and evolution, to social conditions, to culture and politics.[7] Despite their differences, all these perspectives agree that in one way or another—by omission or by commission—reason is implicated in this continued survival of violence. Critics of modernity, such as Hannah Arendt or Zygmunt Bauman, lay violence squarely at the doorstep of reason. They see violence as instrumental to reason and view it as a direct outcome of the Enlightenment project—an inevitable consequence of its efforts to control and compartmentalize human life in the name of putative progress, technocratic efficiency, and governmental bureaucratic logic.[8] As Gianni Vattimo summarized:

> The discovery that the rationalization of the world turns against reason and its ends of perfection and emancipation, and does so not by error, accident, or a chance distortion, but precisely to the extent that it is more and more perfectly accomplished.[9]

Others try to vindicate reason and modernity from the alleged complicity in violence. Dan Stone, for example, in his article "Modernity and violence: theoretical reflections on the *Einsatzgruppen*,"[10] disputes the argument that violence is a logical

---

[7] Here are some references to these different perspectives: Martin Enserink, "Searching for the Mark of Cain," *Science*, vol. 289, no. 5479 (July 28, 2000), pp. 575-580; H. J. Eysenck, "The Origins of Violence," *Journal of Medical Ethics*, vol. 5, no. 3 (1979), pp. 105-107; Suzanne Maiello, "Broken links: attacks or breakdown? Notes on the origins of violence," *Journal of Child Psychotherapy*, vol. 26, no. 1 (2000), pp. 5-24; Christopher J. Ferguson and Kevin M. Beaver, "Natural born killers: The genetic origins of extreme violence," *Aggression and Violent Behavior*, vol. 14, no. 5 (September), pp. 286-294; Alexander Lee, "Who Becomes a Terrorist? Poverty, Education, and the Origins of Political Violence," *World Politics*, vol. 63, no. 2 (2011), pp. 203-245; Arjun Appadurai, "Dead Certainty: Ethnic Violence in the Era of Globalization," *Development and Change*, vol. 29, no. 4 (October 1, 1998), pp. 905-925; José Casanova, "Cosmopolitanism, the clash of civilizations and multiple modernities," *Current Sociology*, vol. 59, no. 2 (2011), pp. 252-267; Hannah Arendt, *On Violence* (New York: Harcourt, Brace & World, 1970); Barrington Moore, "Thoughts on Violence and Democracy," *Proceedings of the Academy of Political Science*, vol. 29, no. 1 (January 1, 1968), pp. 1-12; Georges Bataille, *The Accursed Share: An Essay on General Economy* (New York; London: Zone; Distributed by MIT, 1991); Peg Birmingham, "On Violence, Politics, and the Law," *The Journal of Speculative Philosophy*, vol. 24, no. 1 (2010), pp. 1-20; Zygmunt Bauman, *Modernity and the Holocaust* (Ithaca, N.Y: Cornell University Press, 1989); René Girard, *The Scapegoat* (Baltimore: Johns Hopkins University Press, 1986); Dan Stone, "Modernity and violence: theoretical reflections on the Einsatzgruppen," *Journal of Genocide Research*, vol. 1, no. 3 (November 1999), pp. 367-78.

[8] Hannah Arendt, *On Violence* (New York: Harcourt, Brace and World, 1970); Zygmunt Bauman, *Modernity and the Holocaust* (Ithaca: Cornell University Press, 1989).

[9] Gianni Vattimo, *The Transparent Society* (London: Wiley, 1992), as cited in Dan Stone, "Modernity and violence," p. 375.

[10] Special paramilitary death squads in Nazi Germany that were responsible for most of the mass killings of civilian population during World War II.

consequence of modernization. Although he recognizes the fact that violence and modern civilization can coexist and that violence can survive within modernity, he does not see them as intimately and logically connected. In his nuanced reading of the reports by *Einsatzgruppen*, Stone tries to show "how the conjunction of rationalized society and violent passions—which exist now as they did before 1945—erupts at certain moments into so apocalyptic a force."[11] Stone sees Nazi violence as a product of the paradox in their project. According to his interpretation, the Nazis attempted to destroy the foundation of modern society; but this attempt, in his view, "was derived from that society itself."[12] It is this contradictory agenda of undermining modernity from within modernity that led to the eruption of violence. As Stone argues:

> What the *Einsatzgruppen* reports demonstrate is the existence of violence within modernity, not violence that rejects modernity, but nevertheless a violence which, in its shabby brutality, cannot simply be seen as a logical consequence of modernization.[13]

Contentions over persistence of violence show how intractable the problem is. Despite concerted efforts to contain it, violence remains ubiquitous. It continues to reappear in places where we least expect it. The ideals of the Enlightenment promised the world of peace, justice, and tolerance. Yet they could not prevent and, as some argue, actually contributed to the terror of the French Revolution, colonialism, world wars, and the savagery of genocides. In trying to understand wars, crimes, abuse, torture, we seek to assert the power of word and human reason and their supremacy over violence. Yet reason and word appear to be impotent against violence. Despite all efforts, violence remains immune to our words and deeds; it always manages to escape capture. It is, as David Bell and Lawrence Schehr put it, "an ineffable of our existence"—uncontainable, unrepresentable, and ultimately uncontrollable.[14]

But why should this be so? Why is violence capable of escaping capture? Why reason seems powerless against it? Is it possible that reason itself contains violence? This question is not new. One encounters this idea, for example, in a curious inversion of the Malthusian loop by George Bataille, who has argued in his *The Accursed Share* (*Le part maudite*) that the economic rationality produces excess energy that needs to be destroyed.[15] To Adorno and Horkheimer, the *Odyssey* reveals "a terrible vengeance" and mutilation that the birth of reason wreaked on the primordial world of myth.[16] Although the answers provided by those who identified reason with violence may not be ultimately convincing, the possibility of reason's complicity in violence that they raise certainly encourages one to explore the conception of reason that has been and continues to be dominant in Western culture.

"Reason" and "rationality" are very familiar words. We often use them without thinking much about the meaning that we attribute to them. We tend to forget that the

---

[11] Stone, "Modernity and Violence," p. 376.
[12] Stone, "Modernity and Violence," p. 375.
[13] Stone, "Modernity and Violence," p. 376.
[14] David F. Bell and Lawrence R. Schehr, "Reading Violence," *SubStance,* no. 86 (1998), p. 3.
[15] Georges Bataille, *The Accursed Share: An Essay on General Economy*, vol. 1 (New York : Zone ; London : MIT Press, 1991).
[16] Theodor W. Adorno and Max Horkheimer, "Odysseus or Myth and Enlightenment," *New German Critique*, no. 56 (Spring 1992), pp. 109-141, p. 140.

way we think about and use reason may not necessarily be universal: it is a product of a particular time and place. The way we think about reason has originated in and evolved during the modern period, and despite its numerous evolutionary permutations and peregrinations, still retains its original core. When reading Voltaire, Rousseau, Kant, or Hegel, we still feel that despite many differences among them and between them and us, the way they and we think about reason is essentially the same. We accept this view of reason as a self-evident truth—a sort of Kantian synthetic a priori judgment. We consider it universal, that is, valid in all possible circumstances and under all conditions. We are so sure of our way of understanding reason that we have rarely, if ever, submitted it to critical examination. We have never really asked ourselves a question if it is really true.

So what is this way that we see reason and how does it shape the way we use it? We can find the answer to this question by looking at some of the products of our use of reason. Let's take, for example, two philosophical perspectives that currently dominate the way we approach and interpret reality—realism and anti-realism.

> As John Searle defines it,
>
> Realism is the view that there is a way that things are that is logically independent of all human representations. Realism does not say how things are but only that there is a way that they are.[17]

According to Searle, the realist view of the world has the following structural features:[18]

> 1. World (or alternatively, reality or the universe) exists independently of our representations of it.
> 2. Human beings have a variety of interconnected ways of having access to and representing features of the world to themselves.
> 3. Some of these representations . . . purport to be about and to represent how things are in reality. To the extent that they succeed of fail, they are said to be true or false, respectively. They are true if and only if they correspond to the facts in reality.
> 4. Systems of representation . . . are human creations, and to that extent arbitrary.
> 5. Complete epistemic objectivity is difficult, sometimes impossible.
> 6. Having knowledge consists in having true representations for which we can give certain sorts of justification or evidence. Knowledge is thus by definition objective in the epistemic sense, because the criteria for knowledge are not arbitrary, and they are impersonal.

As one can see from the above, the ontological separation of the subject and the object is at the very core of the realist view of the world. In accordance with this view, knowledge of reality is possible and involves an infinite asymptotic approximation between objects of reality and our representations of them.

There are numerous philosophical perspectives that disagree with realism. Despite their differences and even incompatibilities, they share some common features that allow

---

[17] John R Searle, *The Construction of Social Reality* (New York: Free Press, 1995), p. 155.
[18] Searle, *The Construction of Social Reality*, pp. 150-51. For reasons of convenience and economy I provide a slightly abridged verbatim version.

grouping them together under the general rubric of anti-realism.[19] Broadly speaking, anti-realism is a philosophical critique of the main tenets of realism. A detailed examination of these disagreements is beyond the scope of this discussion. It is quite sufficient to observe that they all boil down to one fundamental disagreement over the issue of validation. In contrast to realists, anti-realists maintain that we can never be sure how things actually are because a fit between a theory and data is insufficient for truth claims. Paul Horwich, for example, offers the following generalization:

> It [anti-realism] derives from an impression of conflict between the alleged autonomy of the facts (their independence of us) and their accessibility (the possibility of our gaining knowledge of their existence). Consequently, it seems to the anti-realist that something of our naive point of view must be given up; some philosophical move must be made.[20]

In support of their argument anti-realists refer to numerous theories in the past that fitted well with empirical data but have ultimately proven to be false (for example, the theory of flat Earth, the geocentric theory of our planetary system and universe, or the ether theory of light). They also point to the phenomenon of underdetermination—that is, the existence of different and often conflicting theories that are supported by the same empirical evidence—as a proof that a fit is no guarantee of the validity of a theory.[21]

As one can see, there is a fundamental difference between realism and anti-realism. Anti-realism radically disagrees with the realist assertion that reality is knowable. Yet despite this critical difference, both realists and anti-realists have the same core conception of reality and reason. Both posit a gap between the subject and the object, except that the realists believe that this gap can be mediated by reason, while the anti-realists think that the credibility of such mediation is suspect. The gap between the knower and reality that is present in both perspectives indicates that both accept the traditional dualism as a given.

This dualism goes far back to the very early periods in the evolution of human thought. Plato, for example, believed that mind and body were ontologically distinct. The division between thought and reality, mind and matter, body and soul, subject and object, and the knower and the known is characteristic for much of the European, and not only European, intellectual tradition.[22] This ontological dualism powerfully shapes the

---

[19] For a good overview of both realism and its opponents, see Stathis Psillos, *Scientific Realism: How Science Tracks Truth* (London: Routledge, 1999); James Ladyman, *Understanding Philosophy of Science* (London: Routledge, 2001); John R Searle, *The Construction of Social Reality*.

[20] Paul Horwich, "Realism and Truth," *Noûs*, vol. 30 (January 1, 1996), pp. 187-197, p. 188.

[21] On underdetermination see Carl Hoefer and Alexander Rosenberg, "Empirical equivalence, underdetermination, and systems of the world.," *Philosophy of Science*, vol. 61, no. 4 (December 1994), pp. 592-607; Jarrett Leplin, "The Underdetermination of Total Theories," *Erkenntnis*, vol. 47, no. 2 (January 1, 1997), pp. 203-215; Lars Bergström, "Underdetermination and Realism," *Erkenntnis*, vol. 21, no. 3 (November 1, 1984), pp. 349-365; Alberto Cordero, "Realism and Underdetermination: Some Clues from the Practices-Up," *Philosophy of Science*, vol. 68, no. 3 (2001), pp. S301-S312; Darrin Belousek, "Underdetermination, Realism, and Theory Appraisal: An Epistemological Reflection on Quantum Mechanics," *Foundations of Physics*, vol. 35, no. 4 (April 2005), pp. 669-695.

[22] In philosophy of science, dualism often refers to the dichotomy between the "subject" (the observer) and the "object" (the observed). Criticisms of Western science often label this kind of dualism as a flaw in the nature of the scientific enterprise itself. On dualism see Howard Robinson, "Dualism," in Edward N. Zalta, ed., *The Stanford Encyclopedia of Philosophy* (Winter 2011),

way we conceptualize reason and the way it operates. However, is the positing of this gap justified? Is it supported by empirical evidence?

The earlier discussion of Piaget's theoretical contributions shows that one and the same process constructs, on one hand, objects of reality as they appear to us and, on the other, organizes our mind. In other words, it is this process of creation that constitutes true ontological reality, not the subject and the object, which are merely its products. As has been stressed several times, this process plays a vital role in the development of our mind and in the creation of our consciousness, or what we call reason. It is the source of our reason. Our representations of reality will change; our consciousness will change. But the process of creation will remain the same in all of its essential features. Yet despite the importance of the process of creation for understanding human reason and, more generally, reality, we exclude it from our view of reality and represent its products—the subject and the object—as the true ontological reality. Despite the absolute primacy of the process of creation, the conception of reality prevalent in modern culture focuses either on the subject (anti-realists) or on the object (realists) that are merely its products. Thus our conception of reality is fundamentally flawed.

It is hard to overestimate the role of mind and consciousness in our individual lives and our civilization as a whole. Operations performed in our consciousness powerfully affect the way we interpret reality, which, in turn, shapes our actions. Therefore, the exclusion of the process of creation from our view of reality and our conception of reason also has a powerful effect on how we interpret reality and, consequently, how we act. The exclusive focus on the products rather than the process creates a framework for interpreting reality that leaves out the most important part of this reality. It should, therefore, come as no surprise then that when we use this deficient framework, we get a very distorted view of reality. When we apply this framework to interpreting reality, we squeeze reality into the Procrustean bed of our fundamentally limited vision and thus commit an act of violence.

Our interactions with reality involve two principal operations: assimilation and adaptation. Assimilation is an operation that integrates objects of reality into internal functional schemata of the organism. This operation reduces the multiple and diverse world to the internal functions of our organism. Assimilation deprives objects of their autonomy and subordinates them to the functions of the organism. It is a very violent operation that is best exemplified by the devouring of one organism by another.

By contrast, adaptation involves recognition of the autonomy of reality and its objects. It essentially adjusts the functions of the organism to these autonomous objects. For example, due to adaptation, the child begins to modify the mode of prehension depending on the object's shape and texture. Due to adaptation, the organism can establish a more balanced relationship with reality. It creates a possibility for knowing reality as it is rather than reducing it to the functions of the organism. As an operation, adaptation plays an exceptional role in the origin and evolution of human intelligence and knowledge.[23]

In his studies of intelligence Piaget shows that both operations are closely interrelated and play a very important role in the origin and evolution of human

---

http://plato.stanford.edu/archives/win2011/entries/dualism/ (accessed June 21, 2011); Peter Dickens, "Alienation, the Cosmos and the Self," *The Sociological Review*, vol. 57 (March 2010), pp. 47–65.

[23] Jean Piaget, *Behavior and Evolution* (New York: Pantheon Books, 1978).

consciousness and symbolic thought. When we use a deficient framework for interpreting reality, when we disregard the process of creation, we see only its specific product—our own construct. We take this product for reality and we reduce reality to it. By acting in this way, we limit ourselves to performing only one operation—assimilation. Unrestrained by adaptation, assimilation severely limits our capacity for understanding the multiple and diverse world; it does not recognize the autonomy of this reality; it subordinates reality to our own internally generated schemes. The result is a one-sided and self-centered representation of reality.

Human reason (consciousness) regulates our interactions with reality. When our consciousness excludes the process of creation from its field of vision, it creates an inadequate and flawed interpretation of reality. This violence is not exclusively symbolic—that is, producing merely an inadequate knowledge of reality. It has real physical effects.

As a product of the evolution, our consciousness has much in common with the rest of nature. One of the most fundamental processes that operate in our consciousness, as it does in the rest of nature, is conservation. When our consciousness excludes the process of creation from its field of vision, it excludes the most important part of reality. With the process of creation out of the frame, our consciousness can only focus on the disconnected products of this process—the subject or the object—rather than the process itself. As a result, it tends to conserve the products rather than the process; it fetishizes and absolutizes those products and regards them as the only true reality, thus disrupting the process of creation and limiting its creative capacity. As the process of creation evolves and the old products are subjected to the pressure of change, a one-sided consciousness experiences this process of change as a loss of reality.

There are few traumatic experiences that can compare to loss of reality, that is, situations when people get a feeling that they can no longer understand reality or interpret it correctly. For a consciousness that experience such situation, reality becomes a void, an abyss devoid of any meaning, or worse, filled with negative meaning. In words of Shakespeare, time gets "out of joint." Such consciousness develops a sense of disorientation, confusion, and fear. Violence is a very common corollary of fear. To make things worse, the capacity of such severely limited consciousness to cope with this condition is reduced to only one cognitive operation—assimilation. Such consciousness is incapable of critically examining itself; it simply cannot see the internal sources of its predicament. Rather than address the real source of its fear within itself, this consciousness tends to look for the cause of the fear outside itself: it develops the need to construct the enemy, to create a scapegoat on whom it can project its fears.[24] Since fear causes violent reactions, the constructed "enemy" becomes the object of this violence and the destruction of the enemy becomes an obsessive but also an elusive goal—elusive because the true cause of fear is never addressed.

Freud clearly understood the internal mechanism of the need to construct the enemy when he made a perceptive remark in reference to the Bolshevik revolution: "When Bolsheviks destroy all the capitalists, what are they going to do?" No destruction could possibly assuage the Bolshevik or Nazi anxiety, their fear, and consequently their

[24] For an interesting discussion of the phenomenon of demonization and scapegoating see Lori J. Ducharme and Gary Alan Fine, "The Construction of Nonpersonhood and Demonization: Commemorating the Traitorous Reputation of Benedict Arnold," *Social Forces*, vol. 73, no. 4 (1995), pp. 1309–31.

need to construct and pursue the imaginary "enemy." No matter how many victims they sacrificed to their "jealous god," it continued to demand more sacrifices.

Thus one can see that the remarkable survival of violence is due primarily to the fact that reason has allowed violence to subsist on its own powers. Unwittingly and unintentionally we limit the power of our consciousness by excluding the process of creation from its frame of vision and thus profoundly disturbing the required delicate balance between assimilation and adaptation. Thus reason yields to violence by failing to embrace its true reality and the source of its enormous power—the process of creation. This process lies at the very core of reality and its evolution. Our consciousness inherited it in the course of the biological evolution. It is a product of this process. It uses this process to create new forms of organization of reality and propel the evolution. The power of our consciousness in creating new forms is infinite. There is nothing that can prevent it from constructing yet another level of organization.[25] Only when our consciousness fails to embrace its true reality, the power of reason turns into a source of its powerlessness. Its remarkable capacity to create reality turns into destructive violence against reality. Indeed, "the sleep of reason produces monsters."[26]

[25] See Gennady Shkliarevsky, "The Paradox of Observing, Autopoiesis, and the Future of Social Sciences," vol. 24, issue 3 (May/June 2007), pp. 323-332.

[26] The phrase is borrowed from the title of one of Francisco Goya's series of etchings Los Caprichos.

CHAPTER SIX

THE SUSTAINABILITY PROBLEM

Sustainability has been one of the most important topics in public discourse over the last several decades.[1] It is a subject of books and articles, a focus of talk shows and discussions in the media, and a major preoccupation of politicians, pundits, and scholars. Conversations about environment often take place around the dinner table in ordinary households. The number of government and nongovernmental organizations that deal with issues of sustainability and environmental protection has grown exponentially in recent decades. Many international organizations at the highest level concentrate their efforts and resources on problems related to sustainability. Hardly a day goes by without one hearing something about climate change or levels of CO2 in the atmosphere. Sustainability has arguably become the most important social and political issue of our time, right next to the economy and international conflicts.

Definitions of sustainability and its derivatives (such as sustainable development and economic sustainability) abound.[2] I use the term "sustainability" in its most basic sense as the capacity of a system to sustain itself. I will use the following working definition of system with all its imperfections: a system is a set of integrated and interrelated components that perform operations that complement each other and have a common regulatory operation. The system operates in its environment that is reflective of the system but has its own regulatory mechanism. Systems may evolve and may gradually become components, or subsystems, of a new system, forming a hierarchy of systems and subsystems. Each level of this hierarchy represents a distinct level of organization with its own forms.

A large and constantly growing number of people subscribe to the notion that our civilization in the form that it exists today may be unsustainable. This notion has considerable staying power. Scientists from many different fields marshal massive data and use them in their studies—some more alarmist[3] than others—to demonstrate that our environment is in a state of precipitous decline and, if no major changes are made, will

---

[1] Desta Mebratu, "Sustainability and Sustainable Development: Historical and Conceptual Review," *Environmental Impact Assessment Review*, vol. 18, no. 6 (November 1998), pp. 493–520; William E. Rees, "Globalization and Sustainability: Conflict or Convergence?" *Bulletin of Science, Technology & Society*, vol. 22, no. 4 (August 1, 2002), pp. 249–68; Thomas Prugh and Erik Assadourian, "What Is Sustainability, Anyway?" *World Watch*, vol. 16, no. 5 (October 2003), pp. 10–21; Andres R. Edwards, *Sustainability Revolution: Portrait of a Paradigm Shift* (Gabriola Island, Canada: New Society Publishers, 2005).

[2] William C. Clark, "Sustainability Science: A Room of Its Own," *Proceedings of the National Academy of Sciences*, vol. 104, no. 6 (February 6, 2007), pp. 1737–38; Willis Jenkins, "Sustainability Theory," in *Berkshire Encyclopedia of Sustainability, vol. 1, The Spirit of Sustainability* (Great Barrington, Mass.: Berkshire Publishing Group LLC, 2010), pp. 380-84; Tom Kuhlman and John Farrington, "What Is Sustainability?" *Sustainability*, vol. 2, no. 11 (November 1, 2010), pp. 3436–48.

[3] On the extreme alarmist side, for example, Tom Murphy, a physicist from the University of California in San Diego, offers calculations on his popular blog Do the Math, showing that if our energy usage grows by 2.3% a year, in 400 years, the average temperature on the Earth will be above the temperature of boiling. In other words, we will cook ourselves (http://physicsworld.com/cws/article/print/2013/jul/18/web-life [accessed 18 July 2013]).

reach a level of degradation that will make our life on this planet very difficult, if not indeed impossible.[4]

The global community has not been passive in the face of alarming warnings about this threat to our civilization but mounted a vigorous response. Much has changed since the discussion of sustainability started. In an effort to slowdown or even reverse the degradation of our environment, a whole set of policies have been enacted on various levels—from international and national to regional and local, to industries and individual enterprises. Ordinary people are taking very seriously environmental pollution, global warming, or the elevated levels of CO2 in the atmosphere. They have changed their habits and patterns of behavior. There are new attitudes that have taken shape in the last few decades among broad strata of the global population.

Since at least the early 1980s, sustainable development was the leading trend in global efforts to assure the sustainability of human civilization. Yet despite these efforts, sustainability still remains an elusive goal. There is a growing sense of frustration on the part of many who begin to suspect that the sustainability of our civilization may not be an attainable goal; and the problem is not this or that policy, or human flaws, it may not be attainable in principle because of some immutable laws of nature. Dissipation of energy, or entropy, which naturally occurs in our environment and the universe and which is accelerated by our recklessness, is frequently invoked in this connection.

Sustainable development is currently the dominant approach towards the problem of sustainability. This approach is particularly popular in the government and business circles.[5] Its proponents subscribe to the notion that continued development is the key to resolving the problem of sustainability.[6] The Brundtland report is perhaps the most influential document representing this line of thinking.[7] Adopted in 1987 by the UN World Commission on Environment and Development, the document calls for

---

[4] John Gowdy, "Avoiding Self-Organized Extinction: Toward a Co-Evolutionary Economics of Sustainability," *International Journal of Sustainable Development and World Ecology*, vol. 14, no. 1 (February 2007), pp. 27–36; Sylvia A. Edgerton, Michael C. MacCracken, Mark Z. Jacobson, Alberto Ayala, Carol E. Whitman, and Mark C. Trexler, "Prospects for Future Climate Change and the Reasons for Early Action," *Journal of the Air & Waste Management Association (Air & Waste Management Association)*, vol. 58, no. 11 (November 2008), pp. 1386–1400; Thomas Hale, "A Climate Coalition of the Willing," *Washington Quarterly*, vol. 34, no. 1 (Winter2010/2011), pp. 89–101; Yalin Fan, Isaac M. Held, Shian-Jiann Lin, and Xiaolan L. Wang, "Ocean Warming Effect on Surface Gravity Wave Climate Change for the End of the Twenty-First Century," *Journal of Climate*, vol. 26, no. 16 (August 15, 2013), pp. 6046–66; Kirsten Zickfeld, Michael Eby, Andrew J. Weaver, Kaitlin Alexander, Elisabeth Crespin, Neil R. Edwards, Alexey V. Eliseev, "Long-Term Climate Change Commitment and Reversibility: An EMIC Intercomparison," *Journal of Climate*, vol. 26, no. 16 (August 15, 2013), pp. 5782–5809.

[5] John Robinson, "Squaring the Circle? Some Thoughts on the Idea of Sustainable Development," *Ecological Economics*, vol. 48, no. 4 (April 20, 2004), pp. 369–84.

[6] Cf. Carlos J. Castro, "Sustainable Development Mainstream and Critical Perspectives," *Organization & Environment*, vol. 17, no. 2 (June 1, 2004), pp. 195–225; Ramón E. López, Gustavo Anríquez, and Sumeet Gulati, "Structural Change and Sustainable Development," *Journal of Environmental Economics and Management*, vol. 53, no. 3 (May 2007), pp. 307–22; Franck-Dominique Vivien, "Sustainable Development: An Overview of Economic Proposals," *S.A.P.I.EN.S. Surveys and Perspectives Integrating Environment and Society*, no. 1.2 (November 15, 2008), edited by Gaell Mainguy, http://sapiens.revues.org/227.

[7] "Our Common Future. From one earth to one world"—A/42/427 annex, overview—UN documents: gathering a body of global agreements, at http://www.un-documents.net/ ocf-ov.htm (accessed October 8, 2012).

accelerated economic development and improvement in social and environmental conditions around the world as the path towards sustainability. The report unambiguously connects the solution of our ecological problems with the continued development of the economy and our human system in general. The Brundtland vision rests on three main pillars: inter-linkages, intergenerational equity, and dynamic efficiency.[8] In the formulation of the report, sustainable development represents those paths of social, economic, and political progress that "meet the needs of the present without compromising the ability of future generations to meet their own needs."[9]

Critics of sustainable development abound.[10] Their numbers are particularly strong among academics and nongovernmental organizations.[11] They charge that the approach outlined in the Brundtland report does not resolve the fundamental tension between its two principal goals: growth economy and sustainability of natural resources and environment.[12] The alternative, in their view, lies in recognizing and respecting what they see as constraints imposed on human civilization by the physical conditions of our environment.

The camp of the opponents of sustainable development includes many groups that have very different perspectives, but they do share some things in common. They largely belong to the "limits to growth" school of thought, and their common denominator is the rejection of growth models. Steady-state economics and de-growth are two very prominent perspectives in this camp.[13] There are several influential organizations that represent voices of the critics, with the Club of Rome being probably the best known of them.

The role of the opponents of sustainable development has so far been rather limited. Their principal contribution to the debate has been "to dramatize the issue of environmental constraints by projecting a drastic slowdown and even collapse" if we make no changes in our patterns of consumption and in our use of natural resources and sinks.[14] Representatives of this school argue that humankind is now very close to the

---

[8] Kimberly Burnett, Lee Endress, Majah-Leah Rovago, James Roumasset, and Christopher Wada, *Islands of Sustainability in Time and Space*, University of Hawaii's Department of Economics Working Paper Series, Working Paper No. 11-12 (Honolulu: University of Hawaii, 2011).

[9] "Our Common Future," paragraph 27.

[10] Geoffrey Heal, "Valuing Ecosystem Services," *Ecosystems*, vol. 3, no. 1 (2000), pp. 24–30; Michael Gunder, "Sustainability Planning's Saving Grace or Road to Perdition?" *Journal of Planning Education and Research*, vol. 26, no. 2 (December 1, 2006), pp. 208–21; Timothy W. Luke, "The System of Sustainable Degradation," *Capitalism, Nature, Society Journal* (2006); Joan Martínez-Alier, Unai Pascual, Franck-Dominique Vivien, and Edwin Zaccai, "Sustainable de-Growth: Mapping the Context, Criticisms and Future Prospects of an Emergent Paradigm," *Ecological Economics*, vol. 69, no. 9 (July 15, 2010), pp. 1741–47; Vivien, "Sustainable Development."

[11] Robinson, "Squaring the Circle?"

[12] Kuhlman and Farrington, "What is Sustainability?"

[13] Herman E. Daly, "Steady-State Economics: A New Paradigm," *New Literary History*, vol. 24, no. 4 (October 1, 1993), pp. 811–16; Herman E. Daly, "Economics in a Full World," *Scientific American*, vol. 293, no. 3 (2005), pp. 100–107; Vivien, "Sustainable Development"; Clément Levallois, "Can de-Growth Be Considered a Policy Option? A Historical Note on Nicholas Georgescu-Roegen and the Club of Rome," *Ecological Economics*, vol. 69, no. 11 (September 15, 2010), pp. 2271–78; Martínez-Alier et al., "Sustainable de-growth"; Giorgos Kallis, Christian Kerschner, and Joan Martinez-Alier, "The Economics of Degrowth," *Ecological Economics*, vol. 84 (December 2012), pp. 172–80.

[14] An environmental sink is an area or part of the environment in which, or a process by which, one or more pollutants is removed from the medium in which it is dispersed. See also Vinit Bhaskar and Andrew Glyn,

growth limits that Donella Meadows first outlined in 1972.[15] They point out that the consequences of our present course are becoming increasingly visible in the current scarcity of food and oil, the crisis of the global financial systems, and the lack of faith we have in the dominant political and economic systems.[16]

The widespread disappointment caused by the continued deterioration of our global environment and the voices of critics have reinvigorated the debate on sustainability. As it expands, the debate raises fundamental theoretical issues that go to the very heart of the currently dominant perspective on sustainability. Does sustainable development have a sound theoretical foundation? Is it a viable goal? Is it the right time to consider other alternatives before it is too late?

Objections to sustainable development pivot on one basic argument: nature and our environment impose fundamental constraints on our development. They assert that there are ultimate limits as to what our environment and its resources can support in terms of the size of the population and consumption patterns. Central to this argument is one important fact about the physical reality in which we live. This fact is related to dissipation of energy, or entropy production. In the words of Jeremy Rifkin, "Evolution means the creation of larger and larger islands of order at the expense of ever greater seas of disorder in the world. There is not a single biologist or physicist who can deny this central truth . . ."[17]

Human civilization is a dissipative system. It sustains itself by consuming low-entropy inputs and producing high-entropy outputs in its environment. High entropy can manifest itself in different ways: either as scarcity of resources or unavailability of environmental sinks or some combination of the two. But whatever form it takes, these unacceptable levels of entropy in our environment will make it very hostile to human life or even totally unsuitable for biological organisms.

The principal theoretical underpinning for this line of thinking is the second law of thermodynamics that states that in dissipative systems, entropy can never be less than zero. Entropy can only grow. If we continue to increase our dissipative capacities in disregard of the law of entropy, critics claim, we will soon destroy the environment that sustains our civilization.

The connection between the second law of thermodynamics and economic development emerged at the beginning of the 1970s when Nicholas Georgescu-Roegen published his now famous book *The Entropy Law and the Economic Process*.[18] Since

---

eds., *The North, the South and the Environment*, (London: Earthscan Publications and United Nations University Press, 1995); Mebratu, "Sustainability and Sustainable Development," p. 503.

[15] See Donella H. Meadows, *The Limits to Growth: a Report for the Club of Rome's Project on the Predicament of Mankind* (New York: Universe Books, A Potomac Associates Book, 1972); Donella H. Meadows, *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future* (Mills, VT: Chelsea Green Pub, 1992); Donella Meadows, Jorgen Randers, and Dennis Meadows, *Limits to Growth: The Thirty-Year Update* (White River Junction, VT: Chelsea Green Publishing Company, 2004).

[16] Mebratu, "Sustainability and Sustainable Development"; Angela Espinosa, *Complexity Approach to Sustainability: Theory and Application* (n. p.: ICP, 2011).

[17] As quoted in Angelina De Pascale, "Role of Entropy in Sustainable Economic Growth." *International Journal of Academic Research in Accounting, Finance and Management Sciences*, vol. 2, no. 1 (2012), pp. 293–301, p. 295. See also Jeremy Rifkin, *Entropy: Into the Greenhouse World* (New York: Bantam Books, 1989).

[18] Nicholas Georgescu-Roegen, *The Entropy Law and the Economic Process* (Cambridge, MA: Harvard University Press, 1971).

then, many new studies on the subject have appeared that both support and reject the validity of the connection between entropy production, economics, and sustainability.[19] There is no need for an extensive discussion of this rich literature. Rather, one can illustrate the principal arguments by an analysis of an exchange that contains one of the most rigorous analytical expositions of the entropy argument against sustainable development.

In 1997, George F. McMahon and Janusz R. Mrozek published a critical response to an article by Jeffrey T. Young in which Young, like many other sustainable developmentalists, had voiced his disagreement with the limits to growth school of thought.[20] Young argued that scientific and technological innovations were capable of offsetting the most deleterious entropic effects on the environment and of ensuring unimpeded development of our economy and civilization.

In their response, McMahon and Mrozek mount one of the most rigorous critiques of the very axiomatic foundation and logic of sustainable development. They claim that the proponents of sustainable development base their assertions about the future on faulty premises and logic. They further charge that there is no way to provide a logical proof that science and technology are capable of constraining the law of entropy.

Science and technology, McMahon and Mrozek maintain, are based on mathematics and are bounded by the limits of formal decidability. According to the proof provided by Austrian mathematician and logician Kurt Gödel, such systems can never establish their own consistency; in other words, they cannot prove that they do not contain contradictions. In fact, Gödel proves that they will always have contradictions. And since science and technology are based on formal mathematics, there will always be problems that science and technology will not be able to solve. For this reason, any assertion that scientific and technological innovations can constrain future problems is an example of wishful thinking that lacks analytical rigour and cannot demonstrate the truth of its proposition. Therefore, policies based on such thinking essentially pursue an illusion, not something that one can prove one can attain.

The law of entropy, McMahon and Mrozek argue, is not an ordinary empirical law. Rather, it is an axiomatic principle that we use for organizing our knowledge about the universe. One cannot prove that human ingenuity can reverse the effects of entropy because, they contend, one would have to disprove entropy from within the axiomatic system that posits entropy as its organizing principle. In other words, one has to prove something contrary to our formal theory of the universe using this very same formal

---

[19] Jeffrey T. Young, "Entropy and Natural Resource Scarcity: A Reply to the Critics," *Journal of Environmental Economics and Management*, vol. 26, no. 2 (March 1994), pp. 210–13; T. M. Addiscott, "Entropy and Sustainability," *European Journal of Soil Science*, vol. 46, no. 2 (1995), pp. 161–68; Tomas Kåberger and Bengt Månsson, "Entropy and Economic Processes—Physics Perspectives," *Ecological Economics*, vol. 36, no. 1 (January 2001), pp. 165–79; Joshua Floyd, "Thermodynamics, Entropy and Disorder in Futures Studies," *Futures*, vol. 39, no. 9 (November 2007), pp. 1029–44; Arto Annila, Stanley Salthe, and B. Weber, "Physical Foundations of Evolutionary Theory," *Journal of Non-Equilibrium Thermodynamics*, vol. 35, no. 3 (October 2010), pp. 301–21; De Pascale, "Role of entropy."

[20] Jeffrey T. Young, "Is the Entropy Law Relevant to the Economics of Natural Resource Scarcity?" *Journal of Environmental Economics and Management*, vol. 21, no. 2 (September 1991), pp. 169–79; Jeffrey T. Young, "Entropy and Natural Resource Scarcity: A Reply to the Critics," *Journal of Environmental Economics and Management*, vol. 26, no. 2 (March 1994), pp. 210–13; George F. McMahon and Janusz R. Mrozek, "Economics, Entropy and Sustainability," *Hydrological Sciences-Journal-Des Sciences Hydrolo*, vol. 42, no. 4 (August 1997), pp. 501-12.

system. Only on the basis of a different system that would not use entropy as its organizing principle can one produce such proof. And Young does not provide such system. Moreover, even if Young had a different system, McMahon and Mrozek argue, there would be no way of proving that one system is better than the other.

Thus, in their view, the argument for sustainable development fails because it cannot demonstrate that there are conditions under which the entropy law can be constrained. As they categorically state: "Thus no thought experiment nor any sequence of formal statements can decide the truth or falsity of entropy."[21] Because any constraint on entropy is indemonstrable, the idea that we can attain sustainability through continued development has no justification, and therefore, other alternatives—such as limiting growth and consumption or even de-growing our economy—might offer more realistic and provable paths towards sustainability.[22]

In contrast to many other arguments against sustainable development that are usually heavily laden with ideology, the argument made by McMahon and Mrozek appears to be impartial. It is devoid of sweeping condemnations and strident polemics. On first glance, it may appear modest in its scope. But its strength actually lies in this modesty. McMahon and Mrozek make two important points: (1) they prove quite convincingly that proponents of sustainable development have not demonstrated the truth of their proposition; and (2) they also claim that this truth is in principle indemonstrable, and as such, should be held in doubt. The rigor of their arguments is formidable and may be one reason why the article has remained largely unchallenged since the time it has been written. The issue that McMahon and Mrozek raise goes to the very heart of sustainable development—its very axiological foundation—and puts it in serious doubt. For this reason, their argument merits serious attention.

The principal claim that McMahon and Mrozek make centrally pivots on Gödel's proof of consistency and completeness for formal axiomatic systems. There is a huge body of literature written on Godel's theorem, and there is no need for a detailed discussion of this well-traversed terrain.[23] As has been mentioned, Gödel proves that any formal axiomatic system will contain propositions that are indemonstrable within this system. Because our science and technology are based on formal mathematical systems and because all such systems have a problem with decidability, McMahon and Mrozek argue, there will always be problems that science and technology will not be able to solve. Therefore, there is in principle no way of proving that we will be able to produce indefinitely scientific and technological solutions that will constrain entropy in the future because of the fundamental formative nature of this law. That is why we should seriously explore other alternatives that aim at reducing our entropy-producing capacity and limit net entropy growth due to human impact in our environment.

One can certainly agree with McMahon and Mrozek that Young has not demonstrated a possibility of constraining entropy. However, neither have they demonstrated the opposite. In fact, Gödel's proof supports a conclusion that is diametrically opposed to that drawn by McMahon and Mrozek.

Gödel' s proof is very unique in the sense that it is not based on any axiom. In fact, he proves something totally different than what he sets out to prove. Also, Gödel' s

[21] McMahon and Mrozek, "Economics, Entropy and Sustainability," p. 510.
[22] McMahon and Mrozek, "Economics, Entropy and Sustainability."
[23] Ernest Nagel and James R. Newman, *Gödel's Proof* (New York: New York University Press, 1958).

proof involves a very creative act. He devises a procedure for generating unique numbers in a formalized mathematical system. The procedure allows expressing customary symbolic notations familiar to every logician— such as ~ (short for ' not') or ⊂ (short for ' if … then') or V (short for ' or')— in terms of unique numbers, or so-called Gödel numbers. It essentially translates symbolic notations into arithmetical numbers. In other words, Gödel takes signs that establish relations among members of a set and expresses them in terms of this set. In a sense, he represents regulatory operations in terms of numbers they regulate, or a more powerful level of organization in terms of the less powerful one. This creative operation represents what we call in modern terminology "reflective coding."

As has been pointed out earlier, regulation is essential in sustaining any system. It coordinates the functions and relations among all elements of a system and provides a vital link between a system and other systems in its environment. As such, regulation must, in the combinatorial sense, possess a power greater than that of any of the parts of a system or their sum total; in other words, its level of organization is higher. The power of regulation is not magical. It is a product of the very process that constructs the system by equilibrating all of its elements.[24]

Obviously, one cannot use weaker levels of organization to explain more powerful ones; simply put, the former are not powerful enough. Gödel' s procedure equilibrates the two levels; it translates the regulatory operations and represents them in terms of numbers. However, because these operations represent a level of organization that is more powerful than that of the members of the set they regulate, the latter cannot demonstrate the truth of their existence; it is simply not sufficiently powerful and cannot generate the procedure that Gödel' s mind can generate, owing to its greater combinatorial power. In order to demonstrate their truth, the axioms of the system have to be changed.

By constructing a level of organization that incorporates the members of the set and the operations that regulate their relations, Gödel shows that we can always construct a level of organization that can resolve any paradox that appears at a lower level of organization. In fact, Gödel demonstrates that we can construct an infinite number of increasingly more powerful levels of organization that can solve any problem.[25] In other words, there are no limits to our intellectual powers. Gödel also demonstrates the process by which a higher level of organization can be constructed. The operation that he used in his own construction was essentially one of equilibration. Using this operation, Gödel creates a new and more powerful system that incorporates both the numbers and the operations and demonstrates the truth of the existence of both.

The preceding discussion shows that the interpretation of Gödel' s proof by McMahon and Mrozek is narrow. Its field of vision excludes the very action that Gödel has undertaken in proving his theorem. The reading of Gödel's proof offered earlier is broader and more inclusive. It includes the interpretation by McMahon and Mrozek as a particular case—one that excludes the action that Gödel performs in the course of

---

[24] Gennady Shkliarevsky, "The Paradox of Observing, Autopoiesis, and the Future of Social Sciences," *Systems Research and Behavioral Science*, vol. 24, no. 3 (2007), pp. 323–32; Gennady Shkliarevsky, "Science and Its Discontents: Is There an End to Knowing?" *Systems Research and Behavioral Science*, vol. 30, no. 1 (2013), pp. 43–55.

[25] Nagel and Newman, *Gödel's Proof*, pp. 98-102.

proving his theorem. This broader and more inclusive interpretation disproves their argument against development. It also suggests that we can solve the problem of entropy production by constructing more powerful levels of organization that will make such solution possible.

Entropic processes, or dissipation, are a form of equilibration. As such, they play a very important role in the rise of new and more powerful levels and forms of organization.[26] Greater power is the source of disequilibrium, and disequilibrium offers the possibility for producing more entropy. Thermal equilibrium, or the so-called "thermal death," does not mean that energy disappears. It simply takes a new form, with different energy flows. Black holes, for example, represent some of the most energetic states known, and temperatures below the absolute zero require much greater energy inputs than any energy states at positive temperatures.[27]

The perspective currently in vogue is that irreversibility is the most uniquely dominant characteristic of our universe. However, this is not the only possible way to view reality. McMahon and Mrozek, for example, admit that irreversibility is not the only organizing principle on which we base our knowledge. In fact, many of our laws of nature are actually reversible, that is, their organizing principle is diametrically opposed to the organizing principle of irreversibility.[28] As physicist Peter Corning observes, "even as the existing 'stock' of available energy in the universe is being dissipated, more is being created."[29] The currently dominant view on irreversibility appears to be a result of the preference for one organizing principle of knowledge rather than another, or as physicist F. A. Hopf suggests "an artifact of our ignorance."[30] In another example, astrophysicist Manasse Mbonye does not see our universe as dominated by either irreversibility or reversibility but rather as being "always in search of a dynamical equilibrium."[31] Numerous critics of the dominant role of irreversibility and the Big Bang theory point to the highly speculative nature of this perspective. They argue that it is merely an extrapolation from the current conditions of our universe into the past— an operation that is always tentative and risky—and charge that it still lacks unambiguous empirical support. Sean Carroll, for example, observes that "… scenarios of this type are extremely speculative and may very well be wrong."[32] Paul Steinhard and Neil Turok--two prominent critics of the Big Bang—make a similar argument and propose their own cyclical theory of the universe that is based on reversibility as its organizing principle.[33] On close analysis, reality is constantly in a state of flux, constantly evolving. It is a dynamic system; and as all dynamic systems, it is neither in a state of equilibrium nor in a state of disequilibrium, never random or ordered. In fact, dynamic systems are always

---

[26] Shkliarevsky, "Science and Its Discontents."
[27] Charles Choi, "Atoms Reach Record Temperature, Colder than Absolute Zero | LiveScience," http://www.livescience.com/25959-atoms-colder-than-absolute-zero.html (accessed January 14, 2013).
[28] McMahon and Mrozek, "Economics, Entropy and Sustainability."
[29] Peter Corning, "Thermoeconomics: Beyond the Second Law," *Journal of Bioeconomics*, vol. 4, no. 1 (January 1, 2002), pp. 57–88, p. 66.
[30] Corning, "Thermoeconomics," p. 66.
[31] Manasse Mbonye, "Constraints on cosmic dynamics," arXiv:gr-qe/0309135v1 (30 September 2003) (accessed 21 November 2008), pp. 1-2.
[32] Sean Carroll, "Is our universe natural?" arXiv:hepth0512148v1, 13 Dec 2005 (accessed 21 February 2010), p. 5.
[33] Paul Steinhard and Neil Turok, "A cyclic model of the universe," *Science*, vol. 296 (5572) (2002), pp. 1436–40.

in a state best characterized as "the edge of chaos"— a phrase coined by mathematician Doyne Farmer and popularized by Stuart Kauffman.[34]

In their critique of Young, McMahon and Mrozek argue, in my view quite correctly, that one certainly cannot demonstrate the limitations of the view that emphasizes irreversibility (or entropy production) by merely appealing to reversibility. The two organizing principles are opposites, that is, mere inversions of each other. They simply exclude each other and, as a result, there is no way anyone can argue that one is preferable to the other. The lesson of Gödel' s proof is that only a more comprehensive level of organization can reveal the limitations of a reductionist perspective.

The perspective that equilibration (or entropy production) gives rise to disequilibrium, that the growth of equilibrium is always accompanied by the increase in disequilibrium, and that in reality both equilibrium (or reversibility) and disequilibrium (or irreversibility) are always in balance, is broader than either the dominant view emphasizing irreversibility or its opposing view. It incorporates both organizing principles as its particular cases.[35]

This perspective also does not contradict the second law of thermodynamics. This law says that in a closed system, such as our universe, entropy production cannot be less than zero. It does not prohibit a zero level of entropy production. As has been argued elsewhere, equilibration at one level of organization is always accompanied by the growth of disequilibrium at another level of organization, thus making the overall level of entropy production equal to zero.[36] By constantly changing and creating new levels and forms of organization, isolated systems such as our universe can continue to produce entropy and at the same time avoid "thermal death."

It is obvious from the earlier discussion that the solution to the problem of entropy production and consequently to the problem of sustainability lies in constructing new levels and forms of organization. Entropy, as a form of equilibration, is not an enemy to be feared and shunned—the attitude that both the proponents and the opponents of sustainable development demonstrate despite their differences in many other respects. In this perspective, entropy production is an ally we can rely on in sustaining our civilization.

Entropy is a means towards creating new and more powerful levels of organization. As the source of disequilibrium, these more powerful levels of organization will allow us to capture new sources of energy, create new energy flows, and avoid depletion. In light of this approach, entropy production will cease to be a problem but will become part of the solution. By creating new levels and form of organization, we will be able to continue producing entropy and at the same time maintain the overall level of entropy production at zero.

---

[34] See https://en.wikipedia.org/wiki/Edge_of_chaos (accessed on 28 June 2013).

[35] Prigogine and Stengers, *Order out of Chaos*; Tamás Vicsek, "The bigger picture," *Nature,* vol. 418 (2002), p. 131; Stephen Wolfram, *A New Kind of Science* (Champaign, IL: Wolfram Media, 2002); Paul H. Carr, "Does god play dice? Insights from the fractal geometry of nature, *Zygon*, vol. 39, no. 4 (2004), pp. 933–940; Shkliarevsky, "The Paradox of Observing"; Shkliarevsky, "Science and Its Discontents"; Gennady Shkliarevsky, "On Order and Randomness: A View from the Edge of Chaos," April 20, 2011. http://search.arxiv.org:8081/paper.jsp?r=1104.4133&qid=1372596301818mix_nCnN_-392512110&qs=Gennady+Shkliarevsky; Kees Wapenaar and Roel Snieder, "Determinism: Chaos Tamed." *Nature* 447, no. 7145 (June 7, 2007), pp. 643–643.

[36] Shkliarevsky, "Science and Its Discontents."

The argument that the creation of new levels and forms of organization (i.e. development) can solve the problem of entropy production (and thus ensure sustainability) does not prove that opponents of sustainable development are necessarily wrong. It says nothing about a possibility of several paths towards attaining sustainability. So, one has to test this possibility in light of the theoretical perspective that views reality in terms of equilibrium between equilibrium and disequilibrium.

A system sustains itself by conserving its functions. Conservation of functional operations requires their activation; the more they are activated, the more stable they are and the better they are conserved. Activating and coordinating systemic operations are the function of regulation. Regulatory operations trigger systemic functions and thus help conserve them. Thus, conservation and regulation play a vital role in sustaining a system.

Regulation coordinates functional operations of all the subsystems of a system and also provides a vital link between the system and other systems in its environment. It can do so because it represents a combination of all regulatory operations of all the subsystems in a system and, therefore, has a combinatorial power higher than that of any of them or their sum total. It represents a more powerful level of organization than all the subsystems of a system taken together. It is this power that makes a system more than the sum of parts. Owing to this greater power, regulatory operation can connect a system to other systems in its environment and form what Maturana and Varela called structural coupling,[37] creating a new and much more powerful systemic totality.

As a functional operation, regulation also needs to be stabilized. Just like any other operation, regulation stabilizes itself through activation. The more it is activated, the more stable it is. Stabilization involves structural coupling with other systems. The new systemic whole also acquires its own regulation, which is a combination of regulatory operations of its components. This new and more inclusive regulatory operation marks the emergence of a new and still more powerful level of organization.

Thus, one can see the vital connection between the dynamic nature of systems and their conservation. A system conserves itself by fully engaging in the creation of new and more powerful levels of organization. It is the main condition of the survival of any system, particularly one as complex as human civilization. If a system does not evolve, if it does not constantly activate its regulatory operation and does not create new levels of organization, the stability of its regulatory mechanism diminishes. If the functioning of this mechanism is unstable, it does not coordinate the functioning of subsystems properly. With a lack of coordination, the system begins to disintegrate as its subsystems begin to operate increasingly on their own. However, this process of disintegration does not stop there. Subsystems are also systems in their own right. As such, they have their own regulatory operations that need to be stabilized through connections and activation. It is this stabilization that originally led to the creation of the system that incorporated them prior to its disintegration. The decomposition of a system necessarily leads to the undoing of its subsystems. This process eventually and inevitably leads to the collapse of all the underlying levels and forms of organization.

---

[37] Humberto Maturana and Francisco Varela, *The Tree of Knowledge: The Biological Roots of Human Understanding* (Boston & London: Shambhala, 1998); Humberto Maturana, "Autopoiesis, structural coupling and cognition: a history of these and other notions in the biology of cognition," *Cybernetics & Human Knowing*, vol. 9, no. 3–4 (2002), pp. 5–34.

As the preceding discussion demonstrates, the survival of any system, particularly such complex systems as our civilization, is impossible without development. Neither steady state nor de-growth can achieve sustainability. They can only lead to the disintegration of our civilization. In other words, there is no sustainability without development. So, if this is the case, then the development approach should be the way toward ensuring sustainability.

Development has been the principal strategy of the global quest for sustainability since at least the mid-1980s and the Bruntland Report. Yet the results have been mixed, if not disappointing. As has been mentioned earlier, the widespread dissatisfaction with the current approach toward sustainability has generated a great deal of criticism. The criticism of this approach does not come exclusively from the proponents of limits to development or de-growth who regard it as unbalanced and overly anthropocentric.[38] Much criticism actually comes from within the camp of sustainable development. Some developmentalists charge that the current strategy is poorly defined, that its foundational documents, such as the Brundtland Report, are overly general, vague, and contradictory to serve any useful purpose. John Robinson (2004), for example, points out:

> The term "sustainable development" has been seen by some as amounting essentially to a contradiction in terms, between the opposing imperatives of growth and development, on the one hand, and ecological (and perhaps social and economic) sustainability on the other. These critics might indeed be said to believe that trying to achieve sustainable development amounts to trying to square the circle, in the sense of trying to achieve the impossible.[39]

There are also charges that the current policy of sustainable development is merely a façade for neoliberal economics, special interests, and business as usual, that it is too narrow, too market driven, and overly favorable to corporate elites. According to Michael Gunder:

> … the discourse of sustainable development often is deployed simply to further the interests of the entrepreneurial supportive state and its institutions. These are pro-market interpretations of sustainable development that water down the concept of sustainability to literally that of business as usual.[40]

These criticisms point to the need for fundamental revisions of the current policies and the formulation of a new approach.

Jeffrey Young, the target of the article by McMahon and Mrozek, is in many ways a typical representative of the dominant paradigm of sustainable development. Young' s approach is essentially reductionist. He fully subscribes to economic and technological determinism. Young is not particularly concerned with energy because, in his view, the earth is an open system that imports solar energy. His major, if not only, preoccupation is scarcity of material resources. He deems that the market mechanism and technology

---

[38] Robinson, "Squaring the Circle?"; López, et al., "Structural Change"; Martínez-Alier et al ., "Sustainable de-growth."
[39] Robinson, "Squaring the Circle?" pp. 369-70.
[40] Gunder, "Sustainability," p. 209.

with the assistance of recovery and recycling are totally sufficient for resolving any problem arising from resource scarcity.[41] The market mechanism is capable of sensing shortages and triggering (mostly through resource pricing and taxation) technological response. In his own words, "[i]n principle economic models of resource prices which signal relative recourse scarcities are sufficient [to resolve the problem of sustainability]."[42]

As one can see, for Young, the problem of sustainability is primarily an economic and technological problem. Consequently, the solution lies in the market mechanism and technological innovation. In his solution to the problem of sustainability, Young ultimately puts his faith in the spontaneous market forces—the proverbial "invisible hand"—and technological advances in response to these forces. There are several issues with this view. First of all, according to the second law of thermodynamics, entropy production can never be less than zero. The Second Law, however, does not prohibit maintaining entropy at the zero-level. However, as this chapter has argued, in order to maintain the zero-level entropy, the system must constantly evolve and create new and more powerful levels of organization. Therefore, in order to sustain our civilization, we must constantly evolve and create new levels of organization that ensure new flows of energy and resources. As soon as we stop creating new levels, entropy begins to grow.

Our brain is the most powerful form of organization of reality. Our mind can create an infinite number of new and increasingly more powerful levels of organization. The creative capacity of our mind is our best tool in ensuring our survival. Young's perspective assigns a very limited role to human mind. The self-organizing forces of the market are very important and very valuable but their power is not even close to the one possessed by our mind. The mechanism of the market essentially maintains equilibrium. It is incapable, by definition, to embrace disequilibrium and therefore it cannot guide the evolution to new and more powerful levels of organization. Only human mind is capable of performing this task. Yet Young's perspective subordinates human mind to the market mechanism. In his view, human creativity can only respond to the demands of the market, not lead the creation of new levels of organization. It is essentially a dependent and reactive role. In Young's perspective the enormous power of human mind is subordinated to spontaneous organizing forces of the market. In other words, the best resource that we as a civilization have is underutilized. We certainly cannot ensure an infinite sustainability of our civilization by not using our most powerful tool to the fullest extent possible.

Also, although Young and other developmentalists differ in many ways from the opponents of sustainable development, the two share a common view of entropy. Young regards entropy production as an enemy that should and can be constrained. Such a view of entropy production significantly narrows the field of vision of policy planners, limits their options, and precludes them from considering and choosing the most productive directions. For example, the developmentalists provide no answer as to what we should ultimately do about entropy. Some, like Young, simply dismiss the problem; others suggest, as Kåberger and Månsson do,[43] that entropy can be exported but make no indication as to where it could be exported. Because of this view of entropy,

[41] Young, "Entropy and Natural Resource Scarcity."
[42] Young, "Entropy and Natural Resource Scarcity," p. 213.
[43] Kåberger and Månsson, "Entropy and economic processes."

developmentalists tend to look for solutions in limiting entropy production, which often results in constraining rather than enhancing economic development. In other words, their choices tend to work against development rather than for it.

It is no exaggeration to characterize the developmentalist perspective as reductionist. Like Young, most of them subscribe to economic and technological determinism. Even though documents such as the Bruntland Report refer to areas other than economy and technology, they offer few specific proposals for changes in these areas. Spheres such as social, cultural, and eve political receive little attention and only to the degree that they facilitate economic and technological solutions. Neither does the developmentalist perspective envision any need for systemic changes in the economy and its institutions, economic management, or the process of making economic decisions.

The economic theory that underlies sustainable development is also quite narrow and is often aptly characterized as neoclassical. Young's thinking, for example, lies entirely within the current market doctrine that he accepts as the final word; he relies exclusively on the market mechanism (mostly resource pricing and taxation). Such exclusive reliance on the market prevents seeing the full range of choices and may lead to overestimation of the capacity of the market mechanism to address the needs of sustainability. As beneficial as the market mechanism is, it is not a panacea. For example, as man have pointed out, it may be difficult to develop adequate ways of assessing the levels at which entropy production may be priced and taxed.

As any innovation, technological innovation is a complex process that requires many inputs, not just signaling from the market. Although technological innovation may indeed be one response to scarcity, it is not the only response possible. The market can also react to scarcity by increasing prices for products, which may lead to curtailment of production. In other words, the market mechanism may also work against development—the professed goal of developmentalists—rather than for it.

Finally, proponents of sustainable development often display infinite faith in the capacity of science and technology to generate solutions in a sustainability crisis. They seem to be blissfully oblivious to ideological and institutional factors that may have detrimental and deadening effects on scientific and technological creativity. As Hans Weiler points out,

> Specifically, the debate on knowledge and development reveals particularly well how profoundly the notion of knowledge and the practice of its creation and its use is [sic!] affected by political forces. In this respect, the discourse on development is similar to the discourses on gender roles and on democracy which also, in their own way, testify to the political nature of knowledge.[44]

Interestingly, Weiler specifically emphasizes that the influence of politics in knowledge production is particularly evident in the role of the World Bank. As he observes, the role of the World Bank is

> … by no means confined to exercising influence on economic activity and policy. Less well known, but extremely effective is the influence the

[44] Hans N. Weiler, "Whose Knowledge Matters? Development and the Politics of Knowledge," in *Entwicklung Als Beruf*, edited by Theodor Hanf, Hans N. Weiler, and Helga Dickow (Baden-Baden: Nomos, 2009), pp. 485–96, p. 485.

> World Bank wields by imposing an orthodoxy of knowledge to which all countries and institutions that wish to enter into negotiations on financial support with the World Bank must subscribe.[45]

If sustainability requires increased scientific and technological innovation, we need to think about changes in organization and institutional practices in areas relevant to the development of science and technology, such as politics, education, organizational and institutional development, et cetera.

As the earlier discussion shows, there are serious shortcomings in the current approach to sustainable development. The most important one concerns its failure to grasp the full significance of the process of creation and include it as the focal center into their frame of vision. They do not appreciate the fact that only by constructing new levels of organization of our entire civilization we can constrain entropy to zero. By maintaining the existing level of organization we cannot but deplete our limited resources and sinks. They do not see how this process works and how it can be stimulated. For them, technological progress simply happens in response to the market mechanism, that is, without conscious intervention and control of the process of creation. The developmentalists simply assume that technological advances simply happen in response to market conditions, thus showing that their frame of vision excludes the process of creation. As a result, the current developmental perspective tends to treat symptoms of the entropy production problem rather than its cause.

Secondly, the current developmentalist perspective has a very narrow view of the problem of sustainability. It largely regards the complex problem of sustainability of our entire civilization, or what I would call "human system," as a function of its few select areas, with other important subsystems playing essentially a subordinate role. Moreover, these selected areas are accepted basically in their current form with no significant modifications and changes deemed necessary.

The narrowness of the current developmental approach toward sustainability may be one important reason why sustainable development in its current formulation has not successfully dealt with criticisms and failed to create a broad consensus in the sustainability debates that is essential for moving forward. In a word, the current approach toward sustainable development is badly in need of fundamental rethinking.

[45] Weiler, "Whose Knowledge Matters?" p. 489.

CHAPTER SEVEN

THE PROBLEM OF KNOWING

The Controversy Over Knowing

In 1996, John Horgan, then a senior writer for *Scientific American*, wrote a book that made quite a stir in the science community. The title of the book was very provocative: *The End of Science: Facing the Limits of Knowledge in the Twilight of the Scientific Age*.[1] As the title indicates, the author made a claim that modern science had reached its limit. Horgan argued that although some incremental progress was still occurring and might even continue to occur for some time, nothing comparable to the theory of relativity, quantum mechanics or the discovery of the structure of DNA was even in the realm of possibilities. Science simply already made all the major advances there were to be made; our understanding of how the universe worked was, on the whole, completed.

Responses to Horgan' s book revealed sharp divisions in the scientific community. Numerous disagreements with the arguments and the main conclusion of the book ranged from well-mannered academic criticisms to sharp vitriolic attacks. John Maddox, former editor of the *Science* magazine, for example, produced a lengthy book entitled *What Remains to Be Discovered* in which he politely challenged Horgan' s contentions and outlined major areas of science where significant advances should take place in the future. By contrast, biologist Stephen Gould described Horgan' s book as "boring" and physicist Stephen Hawking called it "nonsense." There were also much harsher reactions that revealed raw emotions, irritation and even anger. Horgan was called a quack and a phony whose views of contemporary science were extremely subjective, ill informed, and very biased.

However, there were a significant number of scientists who, on the whole, agreed with Horgan's arguments and did not dispute his reading of the facts. Like Horgan, they believed that in its main contours, the work of science had been completed and no major illuminations awaited us in the future. Biologist Kenneth Miller, for example, observed that "at the core of his [Horgan' s] thesis was an observation that met with agreement among most of the scientists I know— namely, that in a general way, we really do understand how nature works."[2]

The book definitely touched the nerve in the scientific community. Unlike some critics of science from among its opponents (e.g., religious extremists), Horgan was, for many decades (and continues to be), an integral part of the scientific scene. He was well informed about scientific developments and had written a great deal on the subject. He received numerous awards for his writings about science; his contributions appeared in some of the most prestigious publications both in the United States and around the world. He personally knew many distinguished scientists. In a word, Horgan was definitely an

---

[1] John Horgan, *The End of Science: Facing the Limits of Knowledge in the Twilight of the Scientific Age* (Reading, MA: Addison-Wesley Pub, 1996).

[2] John Horgan, "Looking Back at 'The End of Science': More Than a Decade of Lively Debate," *Science & Spirit* (March 2008), p. 43.

insider. His pessimistic conclusions did not spring up from some anti-scientific persuasion but from the very midst of the modern scientific community.

By his own admission, Horgan had been a believer in the open-endedness of science and its infinite progress. His first doubts appeared at the end of the 1980s largely in response to proud affirmations of the capacity of modern science to solve the remaining mysteries of the universe. Stephen Hawking, for example, categorically declared in 1988 that there was a good chance that "the study of the early universe and the requirements of mathematical consistency will lead us to a complete unified theory within the lifetime of some of us who are around today."[3] Although Hawking later retracted this statement,[4] there are still many physicists who continue the search for the elusive final theory of everything. The European Organization for Nuclear Research (CERN) has spent over 10 billion dollars on the Large Hadron Collider to search for the so-called god particle—the Higgs boson—that is supposed to explain gravity and, thus, solve the last mystery of the physical universe. What is going to happen when the last mystery is solved? Where would physics go then?

In his book *The End of Science* Horgan describes his interview in 1989 with distinguished physicist Roger Penrose. Their conversation drifted to the theory of everything—a theory that is supposed to unite all known physical forces in nature and provide the ultimate answer to the puzzle of the universe. "Solving mysteries is a wonderful thing to do," Penrose ruminated. "And if they were all solved, somehow, that would be rather boring."[5]

Penrose's insight reaches into the very heart of the problem—the great paradox that looms at the very core of our knowledge enterprise. We believe in the omnipotence of our mind to know. But if there is no limit to our knowledge, we may at some point know everything. What will happen then? What will continue to inspire our intelligence? Wouldn't then our mind reach its limit, our audacious and exciting journey will be over, and our life will become boring? Penrose's words resonated prophetically with Horgan. Indeed, if the final theory is attained, what does it mean for the scientific enterprise? Does that mean the end of our scientific quest? After all, how much is there to know? As we learn more about the fundamental aspects of reality, is it possible that we will one day learn it all? "In the same way," Horgan argues, "scientists might be unlikely to discover anything surpassing the big bang, or quantum mechanics, or relativity, or natural selection, or DNA-based genetics".[6]

The publication of *The End of Science* has had no significant practical consequences for the scientific community. Scientists continue to do their research as they had had for many years before the publication of the book. The controversy has largely subsided. However, the problem that the book raised has not gone away, and the questions the book asked have remained unanswered;[7] and they are interesting questions. Indeed, many of us are brought up to believe that the progress of science and knowledge will be infinite. However, why should this progress be infinite? Can our belief be

---

[3] Horgan, "Looking Back," p. 43.
[4] Stephen W. Hawking, "Gödel and the End of Physics" (presentation), Texas A&M University, March 8, 2003. http://www.hawking.org.uk/index.php/lectures/91 (accessed February 10, 2012).
[5] Horgan, *The End of Science*, p. 3.
[6] John Horgan, "The End of Science Revisited," *Computer* (January 2004), p. 38.
[7] Mordechai Ben-Ari, "The End of Science Revisited," *Skeptic*, vol. 13, no. 2 (June 2007), pp. 20–27.

proven? In his review of John Maddox' s riposte to Horgan for *The New York Times*, Paul Raeburn, while recognizing that Maddox makes a persuasive case for the future development of science, adds

> Does that mean Horgan was wrong? It may take a few centuries to find out. Horgan recalls the early explorers, to whom the swelling seas seemed infinite. They were wrong; but perhaps the belief sustained them.[8]

The debates that have followed the publication of *The End of Science* have largely focused on whether Horgan is right or wrong. This approach has not proven to be particularly productive. No consensus has emerged between those whom Mordechai Ben-Ari calls accelerationists and the end-of-science scholars.[9] The lines are drawn and the question whether our knowing is infinite or finite remains unanswered.

Rather than tackle this question head-on, a different approach may prove to be more productive: What is the source of this problem? Why has this problem come up in the first place? What is it in our view of reality that has made the emergence of this problem possible? In order to answer these questions, one needs to examine the views of reality that are dominant in our civilization.

Let's go back to some of the main points that have been covered in Chapter Five in the discussion of the two principal epistemological perspectives that are dominant in our civilization—realism and anti-realism. As this discussion has demonstrated, the realist perspective does not promise a complete knowledge of reality; rather, and rather pessimistically, it promises only an infinite asymptotic approximation to such knowledge. Also, according to this perspective, our knowledge in the final analysis depends on the reality external to our mind; this reality is the ultimate arbiter in determining what constitutes knowledge and what does not. Validation of knowledge involves a fit between a theory and "the way things are." As a definition standard among realists goes, knowledge is "justified true belief." It means that to count as knowledge a belief must be true; that is, it should correspond, at least approximately, to the way reality is independently of our theory.[10] In other words, the fit is a necessary condition of knowledge; without it, a belief cannot be considered true and, therefore, cannot constitute knowledge.

Thus, as one can see, according to the realist perspective in modern science, reality external to our mind validates scientific knowledge. It is only fair to acknowledge that on close reading this view on validation implies a strong possibility that science may indeed come to an end or at least to an end of big discoveries. One can submit several considerations in support of this apparent possibility. First of all, because of our constitution and the constitution of the physical universe, our access to the reality external to our mind and available for validation is limited. According to modern

---

[8] Paul Raeburn, "Review of Maddox's Book What Remains to Be Discovered," *New York Times* (January 10, 1999).

[9] Ben-Ari, "The End of Science Revisited," p. 20.

[10] Marian David, "The Correspondence Theory of Truth," *Stanford Encyclopedia of Philosophy*," http://plato.stanford.edu/entries/truth-correspondence/ (accessed October 2, 2011); Searle, *The Construction of Social Reality*; Richard Otte, "Scientific Realism, Perceptual Beliefs, and Justification," *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association* 1990 (January 1, 1990), pp. 393–404; Thomas Weston, "Approximate Truth and Scientific Realism," *Philosophy of Science*, vol. 59, no. 1 (March 1, 1992), pp. 53–74.

science, we live in a universe where nothing can exceed the speed of light. This universe may or may not be infinite, but because of our physical limitations and the laws of nature, we can physically see only so far in our universe. Our universe has a horizon beyond which our gaze does not penetrate. To put it simply, we cannot see or hear anything that does not reach us. The Big Bang is the ultimate limit to how far we can see into the history of our universe. Also, we cannot see what is going on inside a black hole because gravity prevents light from reaching us. Still, another example of what one might call a natural limitation is the principle of uncertainty that is widely accepted in our theorizing about subatomic events. In accordance with this principle, there is no way we can know the actual state of a particle or a quantum system as it is, irrespective of our experimental tools. We cannot, in principle, know the exact state of reality at the subatomic level but only its statistical probability.

This is not to argue that our universe is infinite or finite. It may very well be infinite, but we have access only to its finite part. Because the accepted method of validation requires the establishment of one-to-one correspondence, our beliefs about the inaccessible part of the universe cannot be validated and, therefore, cannot count, according to the realist standards, as proper knowledge. It is simply speculation at best.

Second, our current theory of evolution also supports the view that our capacity to know, even when enhanced by technological devices, is limited. According to this theory, the evolution made us fit to survive in this world, not to know it; our senses are shaped by the evolution for the purposes of survival. If this is the case, then our knowledge that, according to science, is based on our senses is merely a survival tool. In other words, we need knowledge only to the extent required for our survival, and because there are aspects of reality that are not essential for our survival, we may very well never know anything about them. Finally, science is about discovering the laws of nature, and the number of these laws, however big it may be, still must be finite. If it were not, reality would be chaotic; and it is not. Therefore, there are only so many laws of nature that we can discover.

In light of these considerations, one may very well conclude that reality accessible to us limited creatures is limited and therefore our knowledge of it also has a limit. Moreover, realism contends that we may be able only to approximate this limit without ever reaching it. In accordance with the dominant approach to validation of knowledge, whatever ideas or beliefs we may form about the rest of reality, these ideas and beliefs cannot, in principle, be validated and, therefore, cannot count as knowledge.

The anti-realist perspective does not offer more hope either. According to this perspective, we cannot make truth claims based on the validation by a fit between theory and fact. In this perspective, knowledge is not circumscribed by external reality and, therefore, is not limited to the states that the world may be in. Clearly, such view frees knowledge from being dependent on reality for validation; the progress of knowledge can be infinite. However, this freedom comes at a price. In accordance with the anti-realist view, this knowledge is not about anything except our capacity to create. Knowledge has nothing to do with truth; it is relativistic. Although anti-realists reject the realist approach to validation, they offer no adequate approach of their own.

Thus, the realist position maintains that science can attain true knowledge about reality, but the dependence that they establish between knowledge and the reality external to our mind cannot explicitly reject a possibility that scientific exploration may, at some

point, come to an end. The anti-realist perspective, on the other hand, provides a strong support to the idea that the progress of our knowledge is infinite, but they also assert that this knowledge has little, if anything, to do with the way reality actually is. Neither of these positions seems to be satisfactory. We are reluctant to accept the notion that our scientific exploration will come to an end, but at the same time, we do not want to give up the notion that our science can provide us with true understanding of how things actually are. Unfortunately, there just does not seem to be any possibility for reconciling these two positions.

Despite significant differences between the realists and the anti-realists, in one very important respect, their worldviews are very similar: they both posit a gap between the subject and the object. As has already been indicated, the realists believe that this gap can be bridged, whereas the anti-realists reject any possible connection. The gap between the knower and reality indicates that traditional dualism still plays an important role in both perspectives.

As has been stressed earlier, Piaget has shown that the process of construction of symbolic representations is bi-directional.[11] On one hand, it constructs mental representations of external reality in our mind, and on the other, it also develops our consciousness, or what we often call the subject. Thus, one can see that the same process is involved in the construction of both the subject and the object, and intimately relates one to the other. The constructed object and the constructed subject are not mere mental categories; they are represented by the physical organization of neurons and neural networks.

Based on what we know from Piaget and others about the way our thinking operates, we can conclude the following:
(1) There is no ontological gap that separates the subject and the object. The ontological status of this gap is not supported by empirical evidence. Both the subject and the object are products of the same process that creates them both at the same time.
(2) The ontological distinction between thought and reality is also unsupported by empirical evidence. As organization of neurons and neural networks, thought is merely one of the forms of organization of reality. In other words, it is reality. In fact, it is the most powerful form of organization of reality. Unlike other forms of organization of reality, the process of organizing and re-organizing neurons and neural circuits has no limitations and is capable of infinite number of combinations.

The empirical evidence related to the emergence and development of human thought does not support the positing of the ontological gap between thought and reality, mind and matter, subject and object, the knower and the object of knowing. This gap is not a product of empirical observation; it is an example of what Kant called synthetic a priori judgment, or what we usually call self-evident or common sense truth. As the term indicates, common sense truth is not a product of rational judgment. The word "sense" indicates connection to biological factors, whereas the word "common" suggests coherence, consensus—that is, the fact that this knowledge is a product of an agreement among knowers. Neither of these terms points to any connection to rational and critical assessment. The commonly accepted belief regarding the unbridgeable gap that separates the subject from the object does not exist in reality. It appears only if the process of creation is excluded from our conception of knowledge production. We all have an

[11] Piaget, *The Origins of Intelligence in Children*.

immediate experience of this process. Without it, we would not be able to know anything. It is real and so are its products—new forms of organization of reality represented by new organizations of neurons and neural circuits.

The controversy that has surfaced in connection with Horgan' s book is not accidental. Its source is the philosophical premises held by contemporary science and, specifically, its conception of knowledge production. This conception fails to recognize and embrace the very source of our knowledge—the process of creation that generates reality. Our knowledge production is an integral part of this process. Our capacity to produce knowledge is infinite. This capacity is the most compelling proof against Horgan's assertion that our scientific quest will come to an end. It is also a convincing proof—in fact, the only definite proof we can have—that reality is infinite because our capacity to shape and reshape it is infinite. We are the agents who have the potential to make reality infinite, and our true destiny as a civilization is to realize this potential.

The continued existence of the paradox of knowing that plagues our civilization is due exclusively to the failure to recognize the importance of the process of creation. As has been argued earlier, when we fail to recognize the central role of this process, our attention focuses on its products that, for us, substitute for reality. As a result, we try to conserve products, rather than the process. However, the only way to conserve the product is by creating a new level of organization that includes it as a particular case; that is, only by creating new knowledge. A failure to grasp the importance of the process of creation in producing knowledge impedes the production of new knowledge.

As an epistemological perspective, realism dominates our civilization. Many individuals subscribe and practice this approach. It critically affects the way we conduct research; it shapes our institutions, influences our decisions about directions of research, allocations of grants and resources, appointments to teaching and research positions—in a word, it affects all aspects of our practice of knowledge production. Its application is practically universal. And yet, this perspective is not unproblematic.

Even a brief review of John Searle's expanded modern version of the definition of realism that has been cited earlier reveals the problems with this perspective. In his list of the main tenets of realism Searle identifies the following principles:

1. Reality exists independently of our representations.
2. We humans can access this reality.
3. Correspondence between our representations and reality is the main criterion of their validity.
4. Systems of representations are human creations and are, therefore, arbitrary.
5. Complete objectivity is difficult and sometimes impossible.
6. Justification and factual evidence are the most important criteria of objectivity of knowledge. Using these non-arbitrary and impersonal criteria one can establish the objectivity of knowledge.

The first point about the existence of reality independent of our representations provides no justification for this assertion. Searle may be quite right in making this assertion but it certainly requires justification. Ironically, such justification is not particularly difficult to make but making it requires the recognition of the process of creation. At first glance it may seem that such recognition denies the independent existence of reality. As has been pointed out earlier, the same process creates the subject and the object. However, the recognition of the process also makes us aware of our

agency and autonomy. There is a necessary corollary to this recognition. If we recognize our own autonomy, we must at the same time recognize the autonomy of the reality external to us. Otherwise, what are we then autonomous from? Conversely, by not recognizing the existence of reality independent of us we also deny our own autonomy. The failure to recognize the process of creation prevents the realists from recognizing our agency in constructing reality and, hence, our autonomy. And if we do not recognize our own autonomy, we cannot argue for the existence of reality independent of us. The recognition of the autonomous existence of reality is intimately linked with the recognition of our own autonomy.

There is no empirical evidence that supports Searle's second point regarding access to reality. Our mental operations mediate all our contacts with reality; and since our brain has no direct access to reality external to it, neither do we. Searle's insistence on the principle of correspondence as the main criterion for determining whether a representation is true or false also does not stand criticism. Our mind represents the most powerful level of organization of reality. As such, it includes all other levels and forms of organization that have preceded it and, therefore, one can always establish one-to-one correspondence between facts of reality and our mental constructs. That is the reason why past theories, such as flat earth or geocentrism, could have perfectly adequate correspondences with observations. The same reason explains the phenomenon of underdetermination when the same empirical data can support several and even contradictory theories.

Searle's fourth point creates confusion. If all theories are our creations and are "to that extent arbitrary" (that is, subjective), on what ground, other than power, can we claim preference for one theory rather than the other? In light of our experience, the use of power in deciding the validity of knowledge does not appear to be an adequate solution. Point five bolsters the above argument. The assertion that attaining objectivity is difficult and sometimes even impossible further undermines the realist claims to truth. If not objective truth, what then should we strive for? What should be the basis of our claims to truth?

Finally, point six identifies justification and evidence as the criteria that establish the validity of knowledge and its objectivity. According to Searle, the fact that justification and factual evidence are not arbitrary and are impersonal makes them adequate criteria for establishing the objectivity of knowledge. Justification is essentially a procedure that establishes consistency of the proposition with the basic axioms of a knowledge system. Demonstrating consistency between propositions and axioms says nothing about the veracity of the axioms. They are essentially our intuitive a priori judgments, as Kant called them, or self-evident truths, and such common sense truths are not unproblematic. For one thing, axiomatic propositions that served as the foundation of our knowledge systems changed over time. Also, as has been pointed out earlier, common sense truth is not a product of rational judgment. The word "sense" indicates connection to biological factors, whereas the word "common" suggests coherence—the fact that the proposition is a product of an agreement among knowers. Neither of these terms signifies any connection to rational and critical assessment.

Factual evidence essentially establishes correspondence between our mental constructs and observable facts. The principle of correspondence also is not guarantee that a representation of reality is not subjective, as proven by many instances of such

correspondences between failed theories of the past and empirical observations, as well as by the phenomenon of underdetermination. This brief analysis shows that justification and empirical evidence are two criteria that are highly dependent of subjective factors and therefore cannot serve as reliable guarantors of objectivity.

In the absence of truly objective criteria for validating knowledge, power becomes the decisive factor in validating knowledge; and power usually favors incumbent and widely accepted theories. Dominant theoretical views become a substitute for reality and claim exclusive privilege. Alternatives that compete with accepted standard models get little consideration or exposure. Research programs that choose to focus on other than mainstream approaches are not particularly high on the list of projects that receive funding, which obstructs the emergence of new ideas and theories, thus impeding the evolution of knowledge and our civilization.

The belief that reality is ultimately intelligible has sustained our civilization in its quest for knowledge. It has served as an inspiration to many who have devoted their lives to probing mysteries of nature searching for answers to questions that have intrigued and puzzled them. The unprecedented progress in our quest for knowledge has been in many ways the result of this inspiration.

There is, however, another conception of reality that has also emerged in the course of this evolution. It is diametrically opposite to the belief that inspired our progress. In light of this conception, reality appears as fragmented, contradictory, paradoxical, unintelligible, and ultimately unknown. This pessimistic view is quite widespread in our civilization and has gained much influence. Many members of our scientific and intellectual communities believe that there are some mysteries of nature that we will never be able to understand; and not because of some inherent flaws or shortcomings in the way we approach reality, but rather because of the nature of reality itself that is ultimately unknowable.

The controversy between these two perspectives is not merely an academic issue. The view that at its most fundamental level reality is acausal, random and unpredictable, and that statistical probability is the most that we can hope to know about reality has had a cooling, if not chilling, effect on our quest for knowledge. The fact that the progress of our knowledge, at least in some areas, has slowed down may very well be due to this view. For example, there have been no major theoretical breakthroughs in physics since the theory of relativity and quantum mechanics; and that was almost one hundred years ago. Many scientists agree that rendering reality intelligible is not merely an intellectual exercise or a mental diversion, but rather such rendering helps to guide science in its more practical endeavors. As Peter Dear has concluded in his book:

> The intelligibility at the core of natural philosophy has never been inconsequential in the history of the sciences; instead, it has guided and shaped the very content of scientific knowledge, even while that knowledge has relied on appeal to instrumentality as an important complement to science's claim to provide true accounts of nature.[12]

So it is not merely an academic issue whether reality is random or orderly, knowable or unknowable. The solution of this problem is not an idle and

[12] Peter Dear, *The Intelligibility of Nature: How Science Makes Sense of the World* (Chicago: The University of Chicago Press, 2006), p. 174.

gratuitous intellectual exercise. It will have direct effects on the future of our civilization.

But can this problem be solved? Currently, there is no definite answer to this question. In fact, if we take the physical picture of the universe as crucial for understanding the nature of reality, we have to conclude that the pessimistic view definitely has an advantage. The universe described by quantum theory appears to make absolutely no sense when viewed outside its formalism. For example, how can one make sense of non-locality that involves velocities that appear to exceed the speed of light, an absolute constant in general relativity? Or, what should one make of superposition, according to which a quantum system can be in two different states at the same time? The contradictions with our familiar sense of how physical reality operates are so great that even many who are intimately familiar with quantum theory find its puzzles hard to comprehend. Richard Feynman, who received a Nobel Prize for his achievements in quantum mechanics, cautioned:

> Do not keep saying to yourself, if you can possible avoid it, "But how can it be like that?" because you will get 'down the drain,' into a blind alley from which nobody has yet escaped. Nobody knows how it can be like that.[13]

Unsurprisingly, the view of quantum reality as random and uncertain sets limits to what we can know about it. In a characteristic remark Stephen Hawking, one of the most authoritative voices in modern physics, summarizes the view to which many contemporary physicists subscribe:

> I do not demand that a theory correspond to reality because I don't know what it is. Reality is not a quality you can test with litmus paper. All I am concerned with is that the theory should predict the results of measurements. Quantum theory does this successfully.[14]

The view of reality as random is not limited the processes that occur at the level of elementary particles, or the micro level. Some physicists identify macro processes that display quantum phenomena. For example, a group of Russian physicists led by S. Korotaev has described phenomena of non-locality that occur in geomagnetic correlations.[15] Many biologists who subscribe to neo-Darwinism believe that the mechanism of the biological evolution involves random genetic mutations. The late Stephen J. Gould regarded contingency to be the basic creative force of life. In his view, contingency played a decisive role in the evolution: ". . . run the tape again, and the first step from prokaryotic to eukaryotic cell may take 12 billion years instead of two . . . ."[16]

---

[13] Online source at http://www.spaceandmotion.com/Physics-Richard-Feynman-QED.htm#Quotes.Richard.Feynman (accessed on October 20, 2008).

[14] *Scientific American*, July 1996, p. 65.

[15] S. M. Korotaev, et al., "Experimental Study of Macroscopic Non-locality in Large-Scale Natural Dissipative Processes," *NeuroQuantology*, issue 4 (2005), pp. 275-94.

[16] See Steven J. Gould, *Wonderful Life* (London: Penguin Books, 1989), as quoted in Pier Luisi, "Contingency and Determinism," *Philosophical Transactions of the Royal Society of London* A, vol. 361 [2003], p. 1142). Luisi echoes the same contingency view in his article: "At the present stage, one should accept the view that these few proteins of life are with us as the products of the bizarre laws of contingency, followed by chemical evolution processes" (*ibid*., p. 1144). See also Francois Monod, *Chance and*

There have been and still are many scientists who have believed and continue to believe that reality is ordered and that a scientific description of this order is ultimately possible. Einstein's famous adage that "the Old One does not play dice" most succinctly summarizes this position. Although physicists apply deterministic perspectives mostly to the so-called macro domain, there are quite a few physicists and philosophers of physics who interpret quantum phenomena in terms of deterministic laws.[17] Determinists also challenge the contingency perspective on biological evolution. The famous biochemist Christian de Duve advocates a deterministic interpretation of the origin of life on Earth,[18] as does Herbert Morowitz in his well-known book *Beginnings of Cellular Life*.[19]

These competing descriptions of reality are puzzling, and not just to laymen. Many physicists, for example, lament the lack of unity in contemporary physics that represents the physical universe as divided into two very different domains—the macro and the micro. Physicist Karl Svozil describes the situation in contemporary physics as nothing short of a crisis.[20] Carlo Rovelli proclaims that the 20th century scientific revolution is "still wide open" since, in his view, ". . . our present understanding of the physical world at the fundamental level is in a state of great confusion." While recognizing great achievements of contemporary physics, Rovelli still thinks that both general relativity and quantum mechanics—the two most important theoretical perspectives in modern physics—"offer a schizophrenic and confused understanding of the physical world."[21]

Although many physicists would love to see physics provide a more coherent view of reality, the unification is not even in sight. Despite their aspirations for unity, most physicists, according to an article in the magazine *American Scientist*, continue to subscribe to the view that "the world is divided into two realms macro and micro, 'classical' and 'quantum,' logical and contradictory—or, as [physicist John Stewart] Bell put it in one of his essays, 'speakable' and 'unspeakable.'" What complicates the situation even more is that for many physicists "it is not clear where the border between the two realms should be . . ."[22]

The confusion as to the nature of reality raises unsettling questions: Is our world ultimately random or ordered? If it is random at the scale of elementary particles, how can be ordered and obey causal laws on the macro scales? And even more troubling

---

Necessity: Essay on the Natural Philosophy of Modern Biology (New York: Alfred A. Knopf, 1971) and Francois Jacob, *The Possible and the Actual* (Seattle: University of Washington Press, 1982).

[17] Hans Primas, "Hidden Determinism, Probability and Time's Arrow" in H. Atmanspacher and R. Bishop, eds., *Between Chance and Choice: Interdisciplinary Perspective on Determinism* (Thorverton: Imprint Academic, 2002), pp. 89-113 and Jean Bricmont, "Determinism, Chaos, and Quantum Mechanics," http://www.scribd.com/doc/11328575/Jean-Bricmont-Determinism-Chaos-and-Quantum-Mechanics (accessed September 12, 2009).

[18] C. de Duve, *Blueprints for a Cell* (Burlington, NC: Neil Patterson, 1991) and *Life Evolving: Molecules, Mind, and Meaning* (Oxford: Oxford University Press, 2002).

[19] H. J. Morowitz, *Beginnings of Cellular Life: Metabolism Recapitulates Biogenesis* (New Haven: Yale University Press, 1993).

[20] See Karl Svozil's "Science at the Crossroad Between Randomness and Determinism," CDMTCS Research Report Series, CDMTCS-137, May 2000.

[21] Carlo Rovelli, "Unfinished revolution," arXiv:gr-qc/0604045 (2006), p. 1.

[22] Nina Zanghi and Roderich Tumulka, "John Bell Across Space and Time," *American Scientist* (October 2003), viewed at http://www.americanscientist.org/bookshelf/pub/john-bell-across-space-and-time (accessed January 6, 2009).

questions lurk in the background: What ultimately is the use of our scientific enterprise if it cannot provide unambiguous answers about the nature of the world around us? What good is our knowledge about reality, if this reality is ultimately random and does not obey the laws of causality? How can we understand and control such reality? Is science the right direction to pursue in our efforts to understand reality or should we consider alternative ways of knowing?

This is not to overstate the case about the ultimate importance of these philosophical questions. Will the scientists stop doing science just because they have disagreements about the nature of reality? Few would believe that possible. However, making sense of reality has been and continues to be a major source of inspiration for our entire scientific enterprise. A belief that this goal is ultimately doomed to failure and that we may never know how reality actually is runs counter to the spirit that animates scientists and propels scientific progress.

It is not surprising that this climate of confusion has given rise to skepticism regarding our belief in the unlimited potential of science that has dominated our civilization at least since the beginning 19th century. The questioning of the scientific enterprise has already led to a certain "spiritualization" of science, "culture wars," "science wars," and an even greater confusion among both laymen and scientists. The awarding of the Templeton Prize in 2009 to the prominent French theoretical physicist and philosopher of science Bernard d'Espagnat is very symptomatic of the current climate in science. D'Espagnat was awarded the prize for "affirming life's spiritual dimension." The paradoxes of quantum theory have led d'Espagnat and, according to the magazine *Nature*, some other "serious scientists" to conclude that "reality, at its most basic, is perfectly compatible with what might be called a spiritual view of things."[23] In his book *On Physics and Philosophy*, as well as in his other writings, d'Espagnat argues that "reality is ultimately veiled from us," that science offers us "only a glimpse behind that veil," and that this reality is "in some sense divine."[24] In his remarks to the Reuter's correspondent Tom Hanegan, d'Espagnat offered the following reflection:

> I believe we ultimately come from a superior entity to which awe and respect is due and which we shouldn't try to approach by trying to conceptualize too much. It's more a question of feeling.[25]

D'Espagnat is not a lone voice in this "spiritualization." His book *On Physics and Philosophy* in which he develops his views has been positively reviewed by some very prestigious publications. The article in *Nature* cites several prominent scientists, including a neo-Platonist Roger Penrose, whose views resonate with those of d'Espagnat.[26] To Antoine Suarez, the founding director of the Center for Quantum

---

[23] *Nature*, September 8, 2009.
[24] *Nature*, September 8, 2009. The prestigious scientific magazine *Science* published an article about d'Espagnat under a disturbing title "Science Cannot Fully Describe Reality, Says Templeton Prize Winner" (*Science,* March 16 2009).
[25] Tom Hanegan, "French Physicist d'Espagnat wins Prestigious Templeton Prize, Reuters, September 16, 2009 at http://www.reuters.com/article/idUSTRE52F2GC20090316 (accessed July 17, 2010). D'Espagnat's comments for *The Times* (June 16, 2009) were very much in the same vein. "Mystery," he said, "is not something negative that has to be eliminated. On the contrary, it is one of the constitutive elements of being."
[26] *Nature*, September 8, 2009.

Philosophy in Zurich, contemporary theories related to quantum information suggest that "the physical reality is made of words [that] non-neuronal intellects speak to neuronal ones." Using an analogy with Laplace's and Maxwell's demons, he proposes to call these "non-neuronal intellects" quantum angels.[27]

The above is not to sound alarm about some trends in contemporary science. After all, these "spiritual" tendencies are hardly prevalent among scientists and have limited effect on how they actually do science. As the example of Newton and of other scientists shows, one can be a religious person and still do very good science. Rather, this is to draw attention to the confusing descriptions that generate these tendencies.

However, this is also not to make light of the current confusion. It is not entirely inconsequential either for the current cultural climate or for the progress of science. Many scientists would like to see modern science produce a more coherent understanding of reality. They believe that a more unified vision will offer better prospects for the future evolution of science. John Baez reflects this attitude in the following passage:

> General relativity and quantum field theory are based on some profound insights about the nature of reality. These insights are crystallized in the form of mathematics, but there is a limit to how much progress we can make by just playing around with this mathematics. We need to go back to the insights behind general relativity and quantum field theory, learn to hold them together in our minds, and dare to imagine a world more strange, more beautiful, but ultimately more reasonable than our current theories of it.[28]

Expressing a wide-spread hope in the scientific community, Adrian Kent writes: " . . . almost everyone suspects that a grander and more elegant unified theory . . . await us."[29] However, despite these passionate appeals and hopes, the goal of having a unified picture of reality continues to be elusive and the question of whether reality is random or deterministic remains unresolved.

Epistemological Roots of the Problem of Randomness vs. Determinism

As has been indicated earlier, there are two principal positions on the nature of reality among scientists. According to one position, reality as ultimately random and unpredictable; the other position views reality essentially in deterministic terms. The first position largely owes its inspiration to quantum mechanics. Francis Bailly and Giuseppe

---

[27] Antoine Suarez, "Classical Demons and Quantum Angels. On 't Hooft's Deterministic Mechanics" (arXiv: 0705.3974 v.1 [quant-ph] 27 May 2007, accessed April 29, 2009), pp. 6 and 13. Elsewhere in the same article, Suarez further elaborates: "In conclusion, the experiments testing quantum entanglement rule out the belief that physical causality necessarily relies of observable signals and that an observable event (the effect) always originates from another observable event (the cause) occurring before in time. This means that quantum correlations have roots outside space-time and, in this sense, originate from a free and intelligent agent. One is led to accept 'the two freedoms': the freedom of the experimenter and the freedom of Nature, and to see quantum randomness as a particular expression of free will" (Suarez, "Classical Demons," p. 6)

[28] As quoted in John Small, "Why do Quantum Systems Implement Self-Referential Logic? A Simple Question with a Catastrophic Answer," in D. M. Dubois, ed., *Computing Anticipatory Systems: CASYS'05: Seventh International Conference* (American Institute of Physics, 2006), p. 167.

[29] Adrian Kent, "Night Thoughts of a Quantum Physicist," arXiv:physics/9906040 [physics.pop-ph] (2000), p. 77.

Longo, for example, relate randomness to quantum non-separability and non-locality, and regard it as intrinsic to the processes that occur on the level of elementary particles—the level that they, among many others, consider the most fundamental to nature.[30] Geoffrey Hellman in his piece "Einstein and Bell: Strengthening the Case for Metaphysical Randomness" makes a similar argument in support of the ultimately random behavior of quantum mechanical systems.[31] Others, like Jean Bricmont and Hans Primas, see ontic determinism lurking behind the appearance of quantum randomness.[32]

Despite the fact that the two positions are diametrically opposed to each other, they do share some unsettling questions: If you have some random or deterministic phenomena, how do you know that they are truly random or truly deterministic? Can one demonstrate that the randomness or determinism of these phenomena is truly ontic?

In his article Ulvi Yurtsever makes a strong argument that quantum mechanical probabilities are truly genuine, that is, that they are algorithmically random, or incompressible. However, he also emphasizes that "no algorithmically incompressible binary string can ever be *constructed* via a finitely-prescribed procedure (since, otherwise, such a procedure would present an obvious algorithm to compress the string thus obtained)."[33] This observation recognizes that although truly algorithmically random strings may indeed exist, their existence cannot be demonstrated.

In the opposite camp, Jean Bricmont's analysis yields a result that simply dismisses the entire issue of the intrinsic nature of determinism as ultimately irrelevant. Bricmont examines two current definitions of determinism. He finds that one definition in which determinism is conflated with predictability renders determinism trivially false. As to the other definition that avoids conflation, Bricmont raises a question whether there is a function—in a Platonic sense (that is, independent of our ignorance)—that determines a finite sequence of sets of numbers that never repeats itself in a unique way. His answer is that the existence of such function is simply impossible to disprove because one can always find a function or even many functions that map "each set into the next one."[34] Bricmont's conclusion dismisses the whole issue of determinism as utterly irrelevant to science. In his view, "there is no notion of determinism that would make the question [of determinism] scientifically relevant . . . ontically it [determinism] is true but uninteresting [that is, impossible to disprove]."[35] "I don't know," he adds, "how to formulate the issue of determinism so that the question becomes interesting."[36]

---

[30] Francis Bailly and Giuseppe Longo, "Randomness and Determination in the Interplay Between the Continuum and the Discrete" in *Mathematical Structures in Computer Science*, vol. 17, issue 2 (April 2007), pp. 289-305.
[31] Geoffrey Hellman, "Einstein and Bell: Strengthening the Case of Microphysical Randomness," *Synthese*, vol. 53 (1982), pp. 445-60.
[32] Jean Bricmont, "Determinism, Chaos, and Quantum Mechanics," http://www.scribd.com/doc/11328575/Jean-Bricmont-Determinism-Chaos-and-Quantum-Mechanics (accessed June 22, 2010); Hans Primas, "Hidden Determinism, Probability, and Time's Arrow," in H. Atmanspacher and R. Bishop, eds., *Between Chance and Choice: Interdisciplinary Perspectives on Determinism* (Thorverton: Imprint Academic, 2002), pp. 89-113 (accessed through online version at http://philsci-archive.pitt.edu/archive/00000948/ on August 12, 2010).
[33] Ulvi Yurtsever, "Quantum mechanics and Algorithmic Randomness," arXiv:quant-ph/9806059v2 13 Dec 2000 (accessed May 14, 2008), p. 1.
[34] Bricmont, "Determinism, Chaos, and Quantum Mechanics," p. 4.
[35] Bricmont, "Determinism, Chaos, and Quantum Mechanics," p. 4
[36] Bricmont, "Determinism, Chaos, and Quantum Mechanics," p. 1.

For Hans Primas, determinism refers strictly to ontic descriptions. Like Bricmont, he makes a very convincing argument against conflating, as is often done, determinism with predictability. Even quantum interactions, he stresses, which are notoriously unpredictable, are "governed by *strict* statistical laws."[37] Primas follows the principle of scientific determinism as formulated by the French mathematician Jacque Hadamard. According to this principle ". . . in a well posed forward-deterministic dynamical system every initial state determines all future states uniquely."[38] However, in contrast to others that subscribe to similar definitions of determinism (for example, Laplace), Primas follows Hadamard in regarding the principle of determination as regulative, and not in some absolute sense; in other words, if in some cases this principle is not satisfied, "it can be enforced by choosing a larger state space."[39] According to Primas, such enforcement is perfectly compatible with mathematical probability theory because:

> Every mathematically formulated dynamics of statistically reproducible events can be extended to a description in terms of a one-parameter group of automorphisms on an enlarged mathematical structure which describes a *fictitious hidden determinism*. Consequently, randomness in the sense of mathematical probability theory is only a weak generalization of determinism.[40]

It is not difficult to see similarities in the way that Bricmont and Primas resolve the problem of determinism. Both see that by enlarging the state space one can always find a deterministic function for a sample or a set. This solution resonates with the famous proof of consistency and completeness by the Austrian logician and mathematician Kurt Gödel. As Gödel has shown, any deductive system can have true sentences whose truth is indemonstrable. In order to demonstrate their truth, one should resort to meta-mathematical procedures and construct a new and broader axiomatic structure that would be powerful enough to make such proof possible. However, according to Gödel's proof, even the new and enlarged structure will not be able to escape the same paradox as it will also allow other true but improvable sentences.[41]

As one can see from the above, the three authors have essentially reformulated the whole problem of randomness vs. determinism. In the new formulation, the problem is no longer whether randomness or determinism objectively exist, but rather whether one can offer a proof of this existence. Thus they transform the problem from ontological into epistemological, or from how reality is to how we know. The connection, whether explicit (Bricmont) or implicit (Yurtsever and Primas), with Gödel is also very indicative and significant insofar as Gödel's proof deals with how we know. If the solution of the problem of randomness vs. determinism lies in epistemology, as the above interpretations suggest, it is logical to propose that its origin may also lie in how we know rather than in what is out there.

---

[37] Primas, "Hidden Determinism," p. 1 (emphasis in the original).
[38] Primas, "Hidden Determinism," p. 10.
[39] Primas, "Hidden Determinism," p. 10.
[40] Primas, "Hidden Determinism," p. 1 (emphasis in the original).
[41] See Ernest Nagel and James R. Newman, *Gödel's Proof* (New York: University Press, 1953).

One can also glean the connection of this problem to epistemology from another angle. There is a great deal of empirical evidence suggesting that nature does not give preference to either randomness or determinism. In fact, many natural phenomena point to a close relationship and complex interaction between random and deterministic processes. Many processes in nature can be often classified as random and deterministic at the same time.[42] The Nobel laureate Ilya Prigogine noted a close relationship between random and deterministic processes in his book with a characteristic title *Order out of Chaos*.[43] In his best selling book *A New Kind of Science* Steven Wolfram also shows that randomness can evolve into order and vice versa.[44] Adducing to the fractal geometrical patterns in nature, Paul Carr observes that many natural phenomena reveal "the complex interplay between randomness (symbolized by dice) and global determinism (which loads the dice)." The Neo-Darwinist approach to evolution, as Carr points out, also emphasizes interplay between random genetic mutations and the globally deterministic natural selection.[45] Summarizing the evidence related to such diverse phenomena as turbulent flows and neurons, Tamas Viscek in his article that appeared in *Nature* stresses that:

> . . . in both these systems [turbulent flows and neurons] (and in many others), randomness and determinism are both relevant to the system's overall behavior. Such systems exist on the edge of chaos, they may exhibit almost regular behavior, but also can change dramatically and stochastically in time and/or space as a result of small changes in conditions.[46]

In another piece, also published in *Nature*, Kees Wapenaar and Roel Snieder make a similar point, drawing on evidence from physics:

> Our view of the universe may have shifted from the deterministic to the random, but since the turn of the last century physics itself has provided a less simplistic view. Fields generated by random sources can be used for imaging and for monitoring of systems such as Earth's subsurface, or mechanical structures such as bridges. Randomness is no longer at odds with determinism, it has instead become a new window on the deterministic response of the physical world.[47]

As physicist Joseph Ford succinctly put it, "God plays dice with the universe. But they are loaded dice."[48]

There have also been challenges to the exclusive emphasis on randomness central to standard quantum mechanics. In the most recent one, the physicists

---

[42] Berkowitz, et al., "Ergodic Hierarchy," p. 661.
[43] Ilya Prigogine and Isabelle Stengers, *Order out of Chaos* (New York: Bantam Books, 1984), particularly pp. 292-95.
[44] Stephen Wolfram, *A New Kind of Science* (Champaign IL: Wolfram Media Inc., 2002).
[45] Paul H. Carr, "Does God Play Dice? Insights from the Fractal Geometry of Nature," *Zygon*, vol. 39, no. 4 (December 2003), p. 934.
[46] Tamas Vicsek, "The Bigger Picture," *Nature*, Vol. 418 (11 July 2002), p. 131.
[47] Kees Wapenaar and Roel Snieder, "Determinism," p. 643.
[48] James Glieck, *Chaos: Making a New Science* (New York: Penguin, 1987), p. 314

Sheldon Goldstein, Detlef Dürr, and Nino Zhangi offer an interpretation of quantum mechanics that is, in Goldstein's words, "precise, objective—and deterministic."[49] In their view, the observed randomness is merely apparent. In another challenge, the data obtained in the study of neutron resonances have led a group of physicists at Oak Ridge Electron Linear Accelerator, headed by Dr. Paul Koehler, to question the applicability of random matrix theory to movements of neutrons and protons in the nucleus. The data indicate that the particles in the nucleus are moving in a coordinated fashion, rather than randomly as suggested by random matrix theory.[50] At the same time other physicists report observing quantum phenomena in macro events. A group of Russian physicists, led by S. M. Korotaev, has observed the phenomenon of non-locality, usually associated with the quantum domain, in dissipative geomagnetic macro processes.[51]

Empirical evidence also shows that nature does not favor either equilibrium (associated with randomness) or disequilibrium (associated with determinism). For example, in his interpretation of the state of the universe, astrophysicist Manasse Mbonye conjectures that "the universe is always in search of a dynamical equilibrium," which suggests an interplay between states of equilibrium and disequilibrium.[52] Although the currently dominant cosmological theory asserts that our universe originated in the state of original disequilibrium, or the Big Bang, numerous critics of this theory point to its speculative nature and argue that since it is an extrapolation from the current conditions into the past, this theory is not justified and still lacks unambiguous empirical support.[53]

Why, then, in view of this substantial evidence to the effect that reality shows no preference for either randomness or determinism, the current solutions of the problem are one-sided? Or, rather, what does the fact that these solutions are one-sided tells us?

It is obvious that the selection and interpretation of facts in the current solutions favors a one-sided interpretation. Since the bias toward one-sidedness does not occur in one isolated case, one cannot invoke ignorance as a possible explanation. Rather, one can suggest that there are powerful factors at play, determining these choices. And these factors must be subjective in nature, that is, they are not due to the way reality is, but rather to our way of knowing it.

Randomness, Determinism, and the Nature of the Real

---

[49] Mark Buchanan, "Quantum Randomness May Not Be Random," *New Scientist*, March 18, 2008.
[50] See "Nuclear Theory Nudged," *Nature*, vol. 466, no. 7310 (August 26, 2010), p. 1034.
[51] S. M. Korotaev, et al., "Experimental Study of Macroscopic Non-locality of Large-Scale Natural Dissipative Processes," *NeuroQuantology*, issue 4 (2005), pp. 275-94.
[52] Manasse Mbonye, "Constraints on Cosmic Dynamics," arXiv:gr-qe/0309135v1 30 Sep 2003, pp. 1-2 (accessed November 21, 2008).
[53] Sean Carroll, for example, observes that ". . . scenarios of this type are extremely speculative and may very well be wrong" (Sean Carroll, "Is Our Universe Natural?" arXiv:hep-th0512148v1 13 Dec 2005, p. 5 [accessed February 21, 2010]). Paul Steinhard and Neil Turok—two prominent critics of Big Bang—also point to the speculative nature of this theory and counter it with their own cyclical theory of the universe (Paul J. Steinhard and Neil Turok, "A Cyclic Model of the Universe," *Science*, vol. 296, issue 5572 (May 24, 2002), pp. 1436-40.

Despite the radical differences between the two principal positions on the problem of randomness vs. determinism, there is one fundamental aspect that they share. They both cannot bring randomness and determinism together. In both cases, their particular epistemological perspective does not permit such integration. As a result, each position has to make a choice of either determinism or randomness, but not both.

The need to make a choice and the failure to provide an interpretation that would be capable of integrating the two opposites reveal an enduring influence of the traditional conception of knowledge. This conception views knowledge as a product of more or less passive reflection and does not recognize in any significant way the process by which knowledge is produced. As has been indicated earlier, the failure to recognize the process of creation of knowledge results in dualism, or viewing reality in terms of irreconcilable binaries. As I have argued elsewhere,[54] the most enduring binary opposition—that of the subject and the object—does not result from empirical observations. Rather, it is a necessary outcome of the epistemological perspective that simply does not see the vital link—the process of creation—that connects the subject and the object. As a result, the two appear as disconnected and opposed to each other. Many other constructed binaries—such as mind-matter or randomness-determinism—can be traced to this fundamental failure to recognize the process of the creation of knowledge and to understand its role.[55] Incidentally, the current philosophical differentiation between instrumental science and natural philosophy[56] seems to be equally unjustified as it implies a distinction between thinking and doing, as if thinking is not doing.

Classical epistemologies did not recognize the agency of the knower and did not see this link. In their conception, knowledge appeared as a mere reflection of reality and the knower as a more or less passive observer who was deemed to be capable of observing reality without in any way disturbing it. Simply disregarding the agency of the knower certainly did not eliminate its vital role. It merely led to projecting our mental constructs unconsciously and uncritically on reality, and to substitute these projections for reality.[57]

It has been well over a century since a radical departure from the classical view of the role of the knower. The pivotal point in this departure was the recognition that the knower plays a vital role in constructing knowledge. Two very important examples of this innovation in science are Einstein's theory of relativity and quantum mechanics. The

---

[54] See, for example, Peter Dear, *The Intelligibility of Nature: How Science Makes Sense of the World* (Chicago: The University of Chicago Press, 2006).

[55] See Gennady Shkliarevsky, "Deconstructing the Quantum Debate: Toward a Non-Classical Epistemology, arXiv:0809.1788v1 [physics.hist-ph], p. 8, and "Of Cats and Quanta: Paradoxes of Knowing and Knowability of Reality," arXiv:1012.0289 [physics.hist-ph], pp. 9-10.

[56] See, for example, Peter Dear, *The Intelligibility of Nature*.

[57] See, for example, a discussion of homocentrism and projection in C. A. Hooker, (1991). "Projection, Physical Intelligibility, Objectivity and Completeness: The Divergent Ideas of Bohr and Einstein," *Brit. J. Phil. Sci.*, vol. 42 (1991), 491-511; Henry P. Stapp, "Quantum Theory and the Role of Mind in Nature." arXiv:quant-ph/0103043, March 9, 2001, p. 6; Henry J. Folse, "Bohr's Conception of the Quantum Mechanical State of a System and Its Role in the Framework of Complementarity." arXiv:quant-ph/0210075, October 10, 2002, pp. 4-6.

introduction of the point-of-view invariance for the frame of reference is seminal for the theory of relativity. In Einstein's view, space should look invariant regardless of the frame chosen by the knower. Einstein's dictum is that no frame should be given preference. This central tenet contains a powerful recognition that all frames are constructed and therefore all are equal. The only non-relativistic component in Einstein's picture of the universe is light. The speed of light has to be the same for all frames, and therefore constant. If it were not, then some frames would have to be recognized as different from others, which would contradict Einstein's principal tenet.

Quantum theory is even more radical in its recognition of the agency of the knower. It does not see the knower as a passive observer but rather as an active agent whose interaction with a quantum system affect that latter. According to quantum theory, the knower's choices, most importantly what and how to measure, radically affects, one may even say produces, the outcome of experiments (for example, measurements performed on a particle). The legendary physicist John Wheeler probably best exemplified this radicalism in his comment that the cosmos "has not really happened, it is not a phenomenon until it has been observed to happen."

Once the agency of the knower was recognized, the acceptance of the notion of the constructed nature of knowledge was soon to follow, and with it, the interest in the process of creation. As has already been discussed, the early pioneering studies by Jean Piaget paved the way for a growing number of contemporary interdisciplinary theoretical approaches that focus on the process of creation.

The focus on the process of creation has given rise to a new epistemological perspective that is decidedly non-dualistic. Piaget, for example, has shown that any advance in the understanding of reality by the child necessarily involves changes in the child's mind and vice versa. In this perspective, the subject and the object no longer stand opposed to each other but are engaged in a productive and mutually enriching relationship. Only when we disregard the process of creation, the two appear as diametrically opposed to each other.

Piaget's studies have also shown that the process of the creation of knowledge is characterized by dynamic equilibrium. Dynamic equilibrium involves a balance between equilibration and disequilibrium. Any increase in equilibrium necessarily involves at the same time an equivalent increase in disequilibrium and vice versa.[58] In his study of the origin of conscious intellect in children,[59] Piaget demonstrates how the equilibration of reflex functions—such as seeing or hearing—generates operations that are more powerful than reflex functions (for example, operations that are capable of constructing permanent mental images). This power differential creates an imbalance commensurate with the increase in equilibrium among reflex functions.

One can see in this example that equilibrium and disequilibrium no longer appear as independent states diametrically opposed to each other and mutually exclusive. Rather, they emerge as intimately related aspects of the same process. Equilibration leads to the growth of equilibrium and disequilibrium at the same

[58] See, for example, Jean Piaget, *The Equilibration of Cognitive Structures: The Central Problem of Intellectual Development* (Chicago: The University of Chicago Press, 1985), particularly pp. 10-15.
[59] Piaget, *The Origin of Intelligence in Children*.

time at the two adjacent but very different levels of organization. Equilibration gives rise to common operations that regulate entities involved in the process of equilibration. These operations are more powerful than each individual entity or their sum total. They are more powerful because their combinatorial potential is much higher than that of the individual entities they regulate. Using the example of Piaget's study mentioned above, the equilibration of functional operations, such as hearing and seeing, offers the combinatorial possibility of "seeing" when hearing and "hearing" when seeing. The enhanced combinatorial power does not stop there. The combination of hearing and seeing leads to the rise of permanent mental images that are present even when actual objects are not. Such mental images open the path to symbolic operations that are practically unlimited in their combinatorial capacity.

Incidentally, the emergence of new properties associated with greater combinatorial power requires rethinking such fundamental concept as causality. The current understanding of causality, shaped by traditional epistemology with its dualistic approach, defines relations as causal when one can reduce—in other words, explain—a state of a system to either the interaction of its components (spatial reductionism) or to another state that precedes it in time (temporal reductionism). One can easily see the inadequacy of this conception of causality when applied to dynamic systems and processes. We know that a system originates from local interaction of components that eventually become its subsystems. However, can we reduce the former to the latter? We certainly cannot. The combinatorial capacity of a system is far more powerful and extensive than those of its subsystems. It is certainly not possible to reduce something that is more powerful to something that is less powerful. Also, the interactions of components that generate systemic constraints certainly precede the emergence of a system in time but, again, for the same reasons as stated above, the latter cannot be reduced to the former.

I have already mentioned earlier the connection that is often made between equilibrium and disequilibrium, on one hand, and randomness and determinism, on the other. Since randomness implies equal probability of all possible interactions without any distinct path and with no time arrow, it is certainly an intrinsic property of equilibrium. A characteristic feature of disequilibrium is a distinct path of interactions that necessarily, one could also say deterministically, leads from unequal probability to equal probability. This unique path allows one to make a clear differentiation between before and after and, consequently, has the time arrow that points toward the future. The presence of the arrow of time is a necessary condition for causality and determinism.

The fact that equilibrium and disequilibrium, on one hand, and randomness and determinism, on the other, are closely related suggests that, just like equilibrium and disequilibrium, randomness and determinism also do not exist independently of each other and neither is dominant over the other. The two are always in balance. Only when we view reality from a perspective that does not take into account the process of creation, we see equilibrium and disequilibrium as two separate and diametrically opposed states. By the same logic, the properties that characterize these states—randomness and determinism—only appear to us as separate and diametrically opposed when we

view reality from a limited perspective of either equilibrium or disequilibrium but not both. And just as in the case of equilibrium and disequilibrium, the reason why randomness and determinism can coexist with each other without creating a paradox is the fact that they are both part of the same process that functions simultaneously at two different, albeit adjacent, levels of organization. What may appear as random when viewed from one level of organization will appear as perfectly ordered when viewed from another level of organization. For example, interactions of the cells in an organism may appear chaotic and unpredictable if more powerful global constraints of the organism that regulate the behavior of the cells are not taken into consideration.

So far the focus of this discussion has been mostly on the creation of knowledge. Although the creation of knowledge is an important part of what is going on in the universe, it certainly cannot stand for reality as a whole. However, if we are to take the notion of evolution seriously, we must conclude that creation of knowledge cannot be an isolated process that has nothing to do with other processes that are taking place in the universe. Our ability to construct knowledge could not have appeared out of nowhere; it could have only emerged from the processes that preceded it in the course of the evolution. As has been pointed out earlier, Piaget has shown the process of the emergence of mental operations from the equilibration of physiological functions of the organism, thus pointing to a link between psychological functions, on one hand, and biological and chemical processes, on the other.[60]

The representation of mind and matter as diametrically opposed has been largely due to the disregard of the process of creation that links the subject, or how we think, and the object, or the way things are. The process of creation is not unique to the human race. Humans have inherited it in the course of the evolution and transformed into a powerful tool for their advancement. As a product of the evolution, the creation of knowledge is but a particular case of the more general process of organization and creation of new forms that we observe at all levels of reality. Therefore, the two must share dynamic features that make them possible, such as dynamic equilibrium, or the balance between the processes of equilibration and disequilibrium.

And there is evidence that they actually do. Just like we find dynamic equilibrium in the creation of knowledge, one can observe the interplay between equilibrium and disequilibrium, or randomness and determinism, in the processes that take place at many other levels of organization of reality: from the sub-atomic level all the way to the cosmic scale. The astrophysicist Manasse Mbonye, for example, sees the interplay of equilibrium and disequilibrium in the processes of space expansion and the creation of matter in our universe. In his view, "the universe is always in search of a dynamical equilibrium."[61] The physicist Paul Carr, echoing the ideas of Stuart Kaufman, also sees interplay between randomness and determinism as "the basis of the inherent creativity of

[60] Piaget, *The Origin of Intelligence in Children.*
[61] Manasse Mbonye, "Constraints on Cosmic Dynamics," arXiv:gr-qe/0309135v1 30 Sep 2003, pp. 1-2 (accessed November 21, 2008).

the natural order and its ability to generate new forms of matter and life."[62] Kees Wapenaar and Roel Snieder offer the following generalization in their article that appeared in the magazine Nature:

> Our view of the universe may have shifted from the deterministic to the random, but since the turn of the last century physics itself has provided a less simplistic view. Fields generated by random sources can be used for imaging and for monitoring of systems such as Earth's subsurface, or mechanical structures such as bridges. Randomness is no longer at odds with determinism; it has instead become a new window on the deterministic response of the physical world.[63]

The ubiquity of dynamic equilibrium in nature suggests that randomness and determinism, just like equilibrium and disequilibrium, do not exist on their own. They are closely interrelated aspects of the general process of organization of reality. They only appear as separate and diametrically opposed when we abstract them from this process. Interactions among subsystems in a system may appear random if we do not take into account global regulations; when these global regulations enter into the field of vision, they will appear perfectly ordered. "Does God play dice?" Paul Carr asks, "Yes and no. Yes, if one considers the random nature of evolution and fractal statistics. No, if one considers their globally deterministic laws and rules."[64]

To recapitulate, randomness and determinism are not separate states in some absolute ontological sense. They only appear so as abstract idealizations of real conditions encountered in nature. They are the ways that these conditions appear to us when we view them from a limited perspective that does not take into account the process of creation. For example, when viewed from the perspective of interacting subsystems--that is, taking no account of the regulatory system—reality appears to be random and chaotic. When, however, viewed from the perspective of the system that regulates the interaction of subsystems, reality appears to be deterministic.

These two limited perspectives correspond to the two approaches in studying reality that are currently in use. The first perspective that emphasizes the interaction of subsystems constitutes the core of the atomistic reductionist approach. The second perspective that focuses on regulatory systems makes up the basis for the holistic approach. The atomistic reductionist approach is by far the more popular of the two. It is important to stress, however, that both approaches are limited and inadequate for providing a comprehensive description of reality. The atomistic approach fails because it tries to reduce the system to its subsystems and their interactions. Such reductionist explanation should fail by definition because it is impossible to reduce (explain) a system to the subsystems that it regulates; the latter are simply not powerful enough. The holistic approach also fails to provide a comprehensive description. It does not and cannot show how a system originates. The system either simply exists or appears as if by a miracle from an unknown intelligent source.

The inadequacy of these two approaches shows that an understanding of the dynamic evolution of reality from one level of organization to another is essential for

---

[62] Carr, "Does God Play Dice?" p. 934.
[63] Wapenaar, "Determinism," p. 643.
[64] Carr, "Does God Play Dice?," p. 937.

providing a comprehensive description. There is a growing realization of the need to abandon the old atomistic, reductionist perspective. It has certainly been successful but the limitations of its one-sidedness are becoming increasingly evident. However, replacing it with its antipode—a holistic approach—as some suggest, [65] will certainly not do. A holistic approach will be just as blind to the process of creation as the traditional reductionist atomism has been. The only way to advance toward a fuller understanding of reality that would avoid the pitfalls of dualism is to fix our gaze on the process of creation. As decidedly non-dualistic, this approach brings randomness and determinism together and explains their close interrelation that one can widely observe in nature.

There is still much that we should know about this dynamic evolution; many details and lacunas still need to be filled. But some general contours are already emerging. The perspectives that focus on the ways that reality organizes itself and creates its new forms of show how local interactions among subsystems give rise to global systemic constraints, or, in other words, how a system emerges from the interaction of the components that become its subsystems, and how the newly emerged system regulates the interaction of subsystems.

Reality is neither orderly nor chaotic. What we see as two separate states are merely aspects of the process of constant organization. Reality is always moving, always in the process of transition from one level of organization to another. For example, what we posit as the initial state of order—the Big Bang—in which our universe supposedly originated, has more to do with the unconscious epistemological preferences than we actually are willing to admit. We may very well be asking in vain questions about the source of this initial order. The view of reality as constantly moving from one level of organization to another suggests that there is no such initial state but merely an infinite cycle of states following one another. One can pose a legitimate question in relation to the theory of Big Bang that posits such initial ordered state: Can we really reduce the current state of the universe to those that preceded it in time, particularly by 14 billion years? By the same token, is it possible to extrapolate the future state of the universe from the current one? Can these subsequent states that will have much greater combinatorial power be reduced to the preceding less powerful ones?

As has been pointed out, the view of the universe that eternally evolves from one level of organization to another, rather than from a highly ordered state to the final thermal death, the view where order and disorder, randomness and determinism do not stand opposed to each other but are merely aspects of the process of this evolution does not reject the Second Law of Thermodynamics that serves as the foundation of the current cosmological theories associated with the Big Bang; it merely requires rethinking of how this law is interpreted and applied. The Second Law says that in any closed system entropy production will either increase or will be 0. In accordance with the new perspective, equilibration, or the growth of entropy, at one level of organization of reality will always create disequilibrium, organization, and consequently a decline in entropy at another level. If the two are balanced, the total entropy of the universe will always be 0.

---

[65] See, for example, Mendel Sachs, *Physics of the Universe* (London: World Scientific, 2010), particularly sections in Postscript: "Physics in the 21st Century" and "Holism"; also Mendel Sachs, "From Atomism to Holism in 21st Century Physics," *Annales de La Fondation Louis de Broglie* 26 (2001), pp. 389–98.

The problem of randomness vs. determinism is not intrinsic to reality. Rather, it is created by one-sided approaches, either atomistic reductionist or holistic, that takes no cognizance of the fundamental dynamic evolution that pervades reality and constitutes its most defining feature. This approach reveals the ultimate futility of trying to define reality in a one-sided manner as either random or deterministic. It is neither. Randomness and determinism, and their concomitant states or equilibrium and disequilibrium, are merely abstractions that make their appearance when we approach reality in a one-sided manner. Reality is eternally balanced between equilibrium and disequilibrium. It is this balance that makes its dynamic evolution possible. Reality never stands still but constantly evolves from one level of organization to another. It is neither in equilibrium nor in disequilibrium, it is neither random nor chaotic, but rather it always exists, as Stuart Kauffman aptly put it, "at the edge of chaos."

Knowledge production plays a very important role in the evolution of our civilization. In fact, one can make an argument that our civilization is to a very large degree about knowledge production. As this chapter demonstrates, there are significant issues, problems, contradictions, inconsistencies, and paradoxes that plague our knowledge production. They all hinder knowledge production and thus impede the evolution of our civilization.

As has been repeatedly pointed out, our civilization has been living in the shadow of the Enlightenment tradition. This tradition has powerfully influenced many aspects of our life, including the way we produce knowledge. The failure of this tradition to take into consideration the process of creation and its lack of understanding of this process have seriously and in multiple ways affected our capacity to produce knowledge. We have to rethink our relationship with this tradition and chart new paths that will enhance our power in producing knowledge.

CHAPTER EIGHT

THEORIZING KNOWLEDGE PRODUCTION: CONTEMPORARY APPROACHES TO CREATIVE PRACTICE

The discussion in the preceding chapters has repeatedly emphasized the importance of the process of creation. This process, this study has been argued, is central to the emergence and evolution of human mind and civilization; as it is, indeed, central to the evolution of reality in general. The failure to recognize the importance of this process has resulted in a very limited view of reality. It has seriously hindered our understanding of the world in which we live and has profoundly distorted our relationship with nature. The destruction of the environment, the continued survival of domination, violence, inequality, and injustice are some of the consequences of this exclusion. In a word, the failure to embrace the process of creation hinders the progress of our civilization and threatens our survival.

The conclusion that follows from the preceding discussion is this: given the importance of the process of creation, we should devote more attention to studying this process and understanding it better. We must gain more knowledge about this process and make extensive use of this knowledge in organizing our social and political practice, our economy, scientific and technological research and development. This process should become the main focal point of the frame of vision through which we view reality; it should be the main organizing principle of our civilization.

As has also been indicated earlier, the amount of attention that the process of creation has been attracting so far is relatively negligible and largely peripheral. Whatever interest we have in this subject is largely an offshoot of pragmatic considerations motivated by our concerns related to economic development and productivity gains. The rapid economic development in the second half of the 20th century has profoundly transformed our society and led to the emergence of what we call knowledge society and creative economy. The progress in science and technology, the development of information and communication industry, the increasing use of robots, computers, and automata are rapidly displacing human labor in performing routine, repetitive mental or physical tasks, and are freeing the growing number of people for performing creative work. In the contemporary society and economy, creativity is at a premium and knowledge production consumes a growing share of investment in our economy.

The interest in knowledge production has been steadily growing since the 1950s. As the world recovered after WWII and many countries rebuilt their economies devastated during the war, economic progress, industrial growth and productivity gains began to increasingly depend on innovation, as well as on advances in science and technology, which created a huge demand for knowledge. The capacity to produce and appropriate knowledge has become a crucial factor in being successful in the increasingly competitive environment. In the age of scarce resources and sinks, knowledge offers real and increasingly important advantages. As a resource, knowledge is inexhaustible. Unlike other resources, knowledge does not depreciate in value since, as Alan Webber

put it, "ideas breed new ideas, and shared knowledge stays with the giver while it enriches the receiver."[1]

The growing demand for knowledge has opened more job opportunities in knowledge production. The number of managers, professionals, and other categories of knowledge workers employed in our economy have been steadily growing with no end in sight. For many young people today the path to a successful and rewarding future lies through college education and professional training. Yet, as some researchers have noted, "despite the importance of knowledge workers . . . [we] know little about how to improve knowledge workers' performances."[2]

As the demand for knowledge has grown, so has the imperative to achieve greater efficiency in knowledge production. Peter Drucker, one of the pioneers of knowledge management, explained in 1978: "To make knowledge work productive will be the great management task of this century, just as to make manual work productive was the great management task of the last century."[3] Drucker is not alone in pointing out the importance of knowledge production in the age of scarce resources. Paul Romer, one of the leading advocates of knowledge economy, writes:

> In a world with physical limits, it is discoveries of big ideas (for example, how to make high-temperature superconductors) together with the discovery of millions of little ideas (better ways to sew a shirt), that make persistent economic growth possible. Ideas are the instructions that let us combine limited physical resources in arrangements that are ever more valuable.[4]

The growing importance of knowledge for our economy has created the need for greater efficiency of knowledge production. The quest for greater efficiency has spurred systematic studies of ways our mind works and produces knowledge. To quote Alan Webber:

> In the end, the location of the new economy is not in the technology, be it the microchip or the global telecommunications network. It is in the human mind.[5]

Knowledge production has been a major preoccupation of several old and new disciplinary and interdisciplinary fields—for example, organization studies, management science, psychology, neurophysiology, information science, computer science, education and learning, knowledge creation and management. New theoretical perspectives—such as systems theory, theory of emergence, complexity theory, self-organization theory, and

---

[1] Thomas H. Davenport and Lawrence Prusak, "Working Knowledge: How Organizations Manage What They Know," *Ubiquity: An ACM IT Magazine and Forum* (August 1-August 31, 2000), p. 13, http://ubiquity.acm.org/article.cfm?id=348775 (accessed June 3, 2015).

[2] Thomas H. Davenport, "Process Management for Knowledge Work," in *Handbook on Business Process Management 1*, edited by Jan vom Brocke and Michael Rosemann, (Berlin, Heidelberg: Springer Berlin Heidelberg, 2010), pp. 17-35; p. 18.

[3] Peter F. Drucker, *The Age of Discontinuity* (New York: Harper & Row, 1978), as quoted in Thomas H. Davenport, Sirkka L. Jarvenpaa, and Michael C. Beers, "Improving Knowledge Work Processes," *Sloan Management Review*, vol. 37, no. 4 (Summer 1996), pp. 53-65; p. 53.

[4] Thomas H. Davenport and Lawrence Prusak, "Working Knowledge," p. 13.

[5] Davenport and Prusak, "Working Knowledge," p. 1.

constructivism—have created the conceptual framework and provided intellectual tools for addressing the issues relevant to knowledge production.

Although much has been done in this area the sad fact remains that, as Thomas Davenport points out,

> . . . despite the importance of knowledge workers to the economic success of countries, companies, and other groups, they have not received sufficient attention. We know little about how to improve knowledge workers' performances, which is very unfortunate.[6]

The response to the need for greater efficiency in knowledge production has been the emergence of a broad interdisciplinary field that combines both theoretical and empirical approaches and that has congealed over the last several decades. It comprises now several schools of thought variously known as knowledge creation, knowledge production, knowledge construction, knowledge building, or knowledge management, and has produced a rich plethora of both theoretical and empirical studies, adding new dimensions to our understanding of knowledge production.

Perhaps the most important change that studies of knowledge production have produced is a decisive shift in the view of knowledge. *The classic view of rational choice approach representing the* mainstream management and organization theory has traditionally dominated the study of knowledge production in organizations. This perspective largely views knowledge production as essentially information processing with knowledge and information used interchangeably in theoretical literature.[7] In accordance with this approach, knowledge production involves gathering information, assessing available alternative courses of action, and choosing the best solution for maximizing utility.[8]

The new approaches have broken away from this model and formulated a new vision. In their view, knowledge production is first and foremost a creative process. One of the most influential theoretical perspectives that represents this new approach is the theory of organizational knowledge creation that was first formulated by Ikujiro Nonaka and Hirotaka Takeuchi in their well-known book *The Knowledge-Creating Company.*[9] Knowledge, according to Nonaka*,*

> . . . cannot be explained sufficiently in terms of information processing or problem solving. Innovation can be better understood as a process in which the organization creates and defines problems and then actively develops new knowledge to solve them . . . Such a sequence of innovation suggests that the organization should be studied from the viewpoint of

---

[6] Thomas H. Davenport, "Process Management for Knowledge Work," in *Handbook on Business Process Management 1*, edited by Jan vom Brocke and Michael Rosemann, (Berlin, Heidelberg: Springer Berlin Heidelberg, 2010), pp. 17-35; p. 18.

[7] Ikujiro Nonaka, Georg von Krogh, and Sven Voelpel, "Organizational Knowledge Creation Theory: Evolutionary Paths and Future Advances," *Organization Studies*, vol. 27, no. 8 (August 1, 2006), pp. 1179–1208; pp. 1180-1181

[8] Nonaka, et al., "Organizational Knowledge Creation Theory," p. 1180.

[9] Ikujiro Nonaka and Hirotaka Takeuchi*, The Knowledge-Creating Company* (New York: Oxford University Press, 1995*).*

how it creates information and knowledge, rather than with regard to how it processes these entities.[10]

Constructivism—another influential trend in the field of knowledge production—holds a very similar view of knowledge. Building on the Western tradition going back to Kant and using the insights from neurobiology, cognitive science, philosophy, and psychology, the constructivist perspective has forcefully argued that knowledge is not "an act of representation" but "an act of construction or creation."[11]

The view of knowledge as an act of creation has shifted the focus in the study of knowledge production away from logocentric rational choice theory with its emphasis on consciousness, rational interests, and logic. Following the distinction made by Michael Polanyi between tacit and explicit knowledge,[12] Nonaka and other proponents of the theory of organizational knowledge creation, emphasized the role of tacit knowledge in knowledge creating processes. In contrast to explicit knowledge that can be captured in writing, formulas, drawings, et cetera, tacit knowledge dwells in human senses, feelings, physical experiences, habits, movements, and intuitions—in the formally unexpressed and inexpressible.[13] According to Nonaka, knowledge creation essentially involves conversion of tacit knowledge into explicit knowledge.[14] Thus, the theory of organizational knowledge creation has shifted the focus in the study of knowledge production to unconscious and irrational aspects of this process. One should point out that this focus clearly resonates with the biological perspective on human knowledge formulated by Piaget.[15]

Another important aspect of knowledge production that organizational and constructivist theorists emphasize is the social side of this process. Both theoretical perspectives argue that innovation and diffusion of knowledge usually occur in the

---

[10] Ikujiro Nonaka, "A Dynamic Theory of Organizational Knowledge Creation," *Organization Science*, vol. 5, no. 1 (February 1994), pp. 14–39; pp. 14-15.

[11] Georg von Krogh, "Care in Knowledge Creation," *California Management Review*, vol. 40, no. 3 (April 1, 1998), pp. 133–53; p. 134. See also Sajna Jaleel and Alie Molly Verghis, "Knowledge Creation in Constructivist Learning," *Universal Journal of Educational Research*, vol. 3, no. 1 (2015), pp. 8–12; Annukka Jyrämä and Anne Äyväri, "Can the Knowledge-Creation Process Be Managed? A Case Study of an Artist Training Project," *International Journal of Arts Management*, vol. 7, no. 2 (2005), pp. 4–14; Ernst von Glasersfeld, *Radical Constructivism: A Way of Knowing and Learning* (London: The Falmer Press, 1995); Heinz von Foerster, (1973) "On constructing a reality," in Wolfgang F. E. Preiser, ed., *Environmental Design Research: Proceedings of the Fourth International EDRA Conference* (Stroudsburg, Pa.: Dowden, Hutchinson & Ross, 1973), pp.35-46; Warren S. McCulloch, *Embodiments of Mind* (Cambridge, Ma.: MIT Press, 1970).

[12] Michael Polanyi, *The tacit dimension* (London: Routledge & Kegan Paul, 1966).

[13] Polanyi, *The tacit dimension*.

[14] Nonaka, et al., "Organizational Knowledge Creation Theory"; Ikujiro Nonaka and Ryoko Toyama, "The Knowledge-Creating Theory Revisited: Knowledge Creation as a Synthesizing Process," *Knowledge Management Research & Practice*, vol. 1, no. 1 (July 9, 2003), pp. 2–10; Ikujiro Nonaka, Katsuhiro Umemoto, and Dai Senoo, "From Information Processing to Knowledge Creation: A Paradigm Shift in Business Management," *Technology in Society*, vol. 18, no. 2 (1996), pp. 203–18; Ikujiro Nonaka, "Creating Organization al Order out of Chaos: Self-Renewal in Japanese Firms," *California Management Review*, vol. 30, no. 3 (1988), pp. 57–73; Ikujiro Nonaka, "A Dynamic Theory of Organizational Knowledge Creation," *Organization Science*, vol. 5, no. 1 (1994), pp. 14–37.

[15] Piaget, *The Origin of Intelligence in Children*.

interactive mode in the web of social and institutional connections.[16] Building on the Japanese philosophical tradition, Ikujiro Nonaka and Noboru Konno have introduced the concept of *ba* that they use to designate the environment where knowledge creating interactions can take place.[17] *Ba,* they point out,

> . . . can be thought of as a shared space for emerging relationships. This space can be physical (e.g., office, dispersed business space), virtual (...), mental (...), or any combination of them. What differentiates *ba* from ordinary human interactions is the concept of knowledge creation. *Ba* provides a platform for advancing individual and/or collective knowledge. It is from such a platform that a transcendental perspective integrates all information needed . . . The concept of *ba* unifies the physical space, the virtual space, and the mental spaces. *Ba* is the world where the individual realizes himself as part of the environment on which his life depends.[18]

Drawing on the socio-cultural theories of Russian psychologist Lev Vygotsky,[19] constructivists also stress the importance of the social interactions in education and learning. Learning, in their view, "is an inherently social and participatory activity, conversational in nature, and where participation involves mutual engagement with other members of the group in negotiating meaning."[20] They have strongly advocated shifting the "locus of constructing knowledge from the individual to collective construction."[21]

There are also other ways in which the new perspectives on knowledge creation have enriched our understanding of this process. The emphasis on creativity and irrational aspects of knowledge creation has led to the recognition of the role of emotions in constructing knowledge. Barbara Simpson and Christine Woods—proponents of the process theory of knowledge--emphasize that the emotional side is frequently overlooked in theories of organization and that emotions can be well accommodated to the knowledge creation process. In their view, the gesture-response process in micro-interactions among individuals involved in knowledge creation is "subjective in nature" and, as such, "is necessarily shaped by human feelings and emotions, albeit frequently at an unconscious level."[22] Jerker Moodysson notes the importance of personal relations

---

[16] Manfred M. Fischer, "Innovation, Knowledge Creation and Systems of Innovation," WGI Discussion Paper No. 71/00 WGI Discussion Papers, 2000, p. 6. URL: http://epub.wu.ac.at/4242/1/WGI_DP_7100.pdf.

[17] Ikujiro Nonaka and Noboru Konno, "The Concept of 'Ba': Building a Foundation for Knowledge Creation," *California Management Review*, vol. 40, no. 3 (April 1, 1998), pp. 40–54.

[18] Nonaka and Konno. "The Concept of 'Ba,'" p. 40.

[19] Lev Vygotsky, *Mind in Society: The Development of Higher Psychological Processes* (Cambridge. MA: Harvard University Press, 1978).

[20] Jean Lave and Etienne Wenger, *Situated learning* (Cambridge: Cambridge University Press, 1991).

[21] Sajna Jaleel and Alie Molly Verghis, "Knowledge Creation in Constructivist Learning," *Universal Journal of Educational Research*, vol. 3, no. 1 (2015), pp. 8–12; p. 8.

[22] Barbara Simpson and Christine Rachel Woods, "Knowledge Creation: Systems Thinking or Process Paradigm?" Knowledge Creation: Systems Thinking or Process Paradigm? https://www.researchgate.net/publication/253988011 (accessed February 1, 2016), p. 10; see also Barbara Simpson and Nick Marshall, "The Mutuality of Emotions and Learning in Organizations," *Journal of Management Inquiry*, vol. 19, no. 4 (December 1, 2010), pp. 351–65.

and friendship in knowledge creation.[23] The emphasis on creativity and emotions has naturally led to the recognition of the aesthetic dimension of knowledge production. A number of researchers including Andrzej Wierzbicki, Yoshiteru Nakamori, Fritz Machlup acknowledge the impact of aesthetic values on constructing knowledge.[24]

Ethics and morality are yet another addition to the study of knowledge creation. Following Michael Polanyi, Nonaka and Konno, for example, recognize the importance of commitment and dedication—distinctly moral qualities—in their theory of knowledge creating organization.[25] Creation of knowledge, in their view, involves the recognition of autonomy, agency and equality of individuals, other than oneself, who are involved in this process; in other words, it involves a moral sentiment.[26] Chuck Huff in his provocative piece "What Does Knowledge Have to Do with Ethics" makes a similar point.[27] In their article "Theoretical Principles for Knowledge Management System Design" Sandra Richardson and her co-authors put much emphasis on the connection between knowledge creation and management, on one hand, and ethical concerns, on the other.[28]

There is a general tendency among many researchers to consider knowledge creation as a comprehensive process that involves all aspects of human nature. In this all-inclusive view, knowledge "is about beliefs and commitment, where 'the power of knowledge to organize, select, learn, and judge comes from values and beliefs as much as, . . . from information and logic.'"[29] Many researchers see knowledge creation in terms of syncretism of truth/knowledge, beauty (aesthetic values), and justice as its equal and inseparable dimensions. According to Wierzbicki and Nakamori, human thought combines many aspects—imagination, intuition, reason, a sense of beauty, and a moral sense—all of which are equally important for generating knowledge.[30]

Although new theoretical approaches have identified many elements and aspects of the process of knowledge creation, an understanding of how the process that creates

---

[23] Jerker Moodysson, "Principles and Practices of Knowledge Creation: On the Organization of 'Buzz' and 'Pipelines' in Life Science Communities," *Economic Geography*, vol. 84, no. 4 (2008), pp. 449–69; p. 463.
[24] Andrzej P. Wierzbicki and Yoshiteru Nakamori, "The Episteme of Knowledge Civilisation," https://www.researchgate.net/publication/29681579_The_Episteme_of_Knowledge_Civilisation (accessed February 22, 2016); Fritz Machlup, *Knowledge: Its Creation, Distribution and Economic Significance*, volume I (Princeton: Princeton University Press, 1980), see particularly chap. 5.
[25] Nonaka and Konno, "The Concept of 'Ba.'"
[26] Nonaka and Konno. "The Concept of 'Ba,'" p. 40.
[27] Chuck Huff, "What Does Knowledge Have to Do with Ethics?" in Gonçalo Jorge Morais Costa, ed., *Ethical Issues and Social Dilemmas in Knowledge Management: Organizational Innovation*, Hershey, PA., New York: IGI Global, 2011).
[28] Sandra M. Richardson, James F. Courtney, and John D. Haynes, "Theoretical Principles for Knowledge Management System Design: Application to Pediatric Bipolar Disorder," *Decision Support Systems*, vol. 42, no. 3 (December 2006), pp. 1321–37.
[29] Kevin Linderman, Roger G. Schroeder, Srilata Zaheer, Charles Liedtke, and Adrian S. Choo, "Integrating Quality Management Practices with Knowledge Creation Processes," *Journal of Operations Management*, vol. 22, no. 6 (December 2004), pp. 589–607; p. 592; Thomas H. Davenport and Laurence Prusak, *Working Knowledge: How Organizations Manage What They Know* (Boston: Harvard Business School Press, 1998), p. 12.
[30] Andrzej P. Wierzbicki and Yoshiteru Nakamori, "The Episteme of Knowledge Civilisation," https://www.researchgate.net/publication/29681579_The_Episteme_of_Knowledge_Civilisation (accessed February 22, 2016), pp. 12-13; see also Fritz Machlup, *Knowledge: Its Creation, Distribution and Economic Significance*, volume I (Princeton: Princeton University Press, 1980), particularly chap. 5.

knowledge actually works remains elusive. Knowledge creation process proves to be intractable and impervious to analytical treatment. Many researchers regard this process as essentially a "black box" activity that involves intuition and experience, rather than a clearly defined procedures or sequences of operations. Calvin Pava feels that diffuse deliberations fit knowledge production much better than a process in the traditional sense of an orderly sequence of activities.[31] Davenport and his colleagues describe this process as "untidy." They see that, unlike other production processes, the production of knowledge, its inputs and outputs "are often less tangible and discrete." In their view,

> There are no predetermined task sequences that, if executed, guarantee the desired outcome. Knowledge workers may operate by an intuitive feel for how to accomplish their work or thought accumulated experience.[32]

This conclusion resonates with observations other authors have made about knowledge production.[33]

As a result of the inadequate understanding of knowledge production, the management of knowledge creation remains a formidable problem that still has not found its solution. Management strategies that work in other areas of production are largely ineffective in knowledge creation. Development of throughput and output metrics proves to be difficult and the assessment of knowledge production has to rely largely on inputs, which makes process management unfeasible.[34] Standardization and routinization of knowledge work, long regarded as key to success of any form of production, still remains a very distant goal. Moreover, the tendency among knowledge workers to exercise considerable autonomy in their work and loyalty to their discipline—an obstacle to process oriented change that Davenport finds particularly serious—makes the introduction of standard routines that are often resisted extremely problematic.[35] Making matters even more difficult, knowledge workers can have a high degree of autonomy in how they do their work, and they can resist the imposition of standard routines and new technologies in their work. Davenport, among many others, finds that knowledge creation work is very difficult to measure and evaluate.[36] As a result, performance among knowledge workers varies considerably.[37]

---

[31] Calvin H. Pava, *Managing New Office Technology: An Organizational Strategy* (New York: The Free Press, 1983).

[32] Thomas H. Davenport, Sirkka L. Jarvenpaa, and Michael C. Beers, "Improving Knowledge Work Processes," *Sloan Management Review*, 37, no. 4 (Summer 1996), pp. 53-65; pp. 54-55.

[33] M. Lynne Markus, Ann Majchrzak, and Les Gasser, "A Design Theory for Systems That Support Emergent Knowledge Processes," *Mis Quarterly* (2002), pp. 179–212; Lucy Suchman, *Plans and Situated Actions: The Problem of Human-Machine Interaction* (Cambridge, UK: Cambridge University Press, 1987).

[34] Thomas H. Davenport, David W. De Long, and Michael C. Beers, "Successful Knowledge Management Projects," *Sloan Management Review*, vol. 39, no. 2 (Winter 1998), pp. 43–57.

[35] Thomas H. Davenport, Sirkka L. Jarvenpaa, and Michael C. Beers, "Improving Knowledge Work Processes," Center for Business Innovationism, 1995, p. 4.

[36] Thomas H. Davenport, "Process Management for Knowledge Work," in Jan vom Brocke and Michael Rosemann, eds., *Handbook on Business Process Management 1* (Berlin, Heidelberg: Springer Berlin Heidelberg, 2010), pp. 17–35; pp. 29-30.

[37] Davenport, et al., "Successful Knowledge Management Projects"; Steven J. Frenkel, Marek Korczynski, Karen A. Shire, and May Tam, *On the Front Line: Organization of Work in the Information Economy* (Ithaca, NY: Cornell University Press, 1999).

Although the rhetoric of both constructivism and organizational knowledge theorists frequently refers to creativity and emergence of new knowledge, they have so far failed to explain the processes of creation of new knowledge, limiting their discourse largely to describing conditions that enhance creativity. In addition, since both theoretical perspectives recognize the decisive role of hierarchies and leadership in the knowledge creation process, it often appears that the role of leaders and managers supersedes and in many ways determines in a restrictive way the activities of ordinary knowledge workers. Despite their insistence that each individual member of organization plays an important role in creating new knowledge,[38] in practical terms Nonaka and other organizational theorists assign the dominant role in this process to managers. In their view, top leaders should formulate vision and strategy that are then "programmed" into all organizational members who are expected to "act accordingly."[39] In Nonaka's view,

> Leaders must support emerging processes with visionary proposals (mind) and a personal commitment of time and power (body). The success of knowledge creation depends on management's assumption of responsibility, justification, financial backing, and caring.[40]

An extensive list of responsibilities of top leaders in knowledge creation leaves little doubt as to who determines the outcome of this process.[41] Even the role of middle managers who constitute a vital link with and have many responsibilities in knowledge creation is quite limited. They must understand, accept, and implement strategies and visions formulated by top managers who for this purpose "communicate self-explanatory messages regarding these strategies' rationale and goals."[42]

Also, the conception of knowledge creation processes by organizational theorists is very much consensus oriented. As Nonaka writes: "Constructive criticism substantiated by reasoned arguments should be used to build a consensus."[43] Critics have noted that "Seeking for general consent within organization also inhibit explicit expression of independent opinions."[44] As Georg von Krogh has pointed out, differences drive innovation and sacrificing them certainly has a very negative effect on the pace of innovation.[45]

The problem of objectivity is another significant issue relevant to knowledge production that still remains unresolved. The view of knowledge as a product of

---

[38] Nonaka, "A Dynamic Theory of Organizational Knowledge Creation," p. 14; Shih-wei Chou and Yu-Hung Tsai, "Knowledge Creation: Individual and Organizational Perspectives," *Journal of Information Science*, vol. 30, no. 3 (June 1, 2004), pp. 205–18; p. 207.
[39] Nonaka, et al., "Organizational Knowledge Creation Theory," p. 1191; Herbert A. Simon, "Strategy and organizational evolution," *Strategic Management Journal*, vol. 14, no. 2 (1993), pp. 131–142.
[40] Nonaka and Konno, "The Concept of 'Ba,'" p. 53.
[41] Nonaka, et al., "Organizational Knowledge Creation Theory," pp. 1191-92.
[42] Nonaka, et al., "Organizational Knowledge Creation Theory," p. 1190; William D. Guth and Ian C. MacMillan 1986 "Strategy implementation versus middle management self-interest," *Strategic Management Journal*, vol. 7 (1986), pp. 313–327.
[43] Nonaka, "A Dynamic Theory of Organizational Knowledge Creation," p.25.
[44] Meng Li and Fei Gao, "Why Nonaka Highlights Tacit Knowledge: A Critical Review," *Journal of Knowledge Management*, vol. 7, no. 4 (2003), pp. 6–14; p. 9.
[45] Georg von Krogh, "Care in Knowledge Creation," *California Management Review*, vol. 40, no. 3 (April 1, 1998), pp. 133–53; p. 148.

construction, or creation, stands in sharp contrast to the traditional perspective on knowledge as reflection, that is, inferred from allegedly unbiased observations of reality. Not only has it undermined the latter's claims of objectivity but it put into question the very notion of objectivity and universality of knowledge. For the proponents of organizational knowledge creation "knowledge . . . is about beliefs and commitments," rather than detached observations. According to Davenport, for organizational theorists

> The power of knowledge to organize, select, learn, and judge comes from values and beliefs as much as, and probably more than, from information and logic. Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms.[46]

In their summary of Nonaka's view of knowledge, the authors of the article "Improving Knowledge Work Processes" write: "Nonaka defines knowledge as 'justified true belief,' where *beliefs are dynamic, relative, unstable, and person dependent*."[47]

Using insights from neurobiology, cognitive science and philosophy, constructivists have formulated a view of knowledge very similar to that of the knowledge creation theorists. To them, as Georg von Krogh has aptly summarized, "cognition is a creative act of bringing forth a world." Krogh further explains:

> Because knowledge resides in our bodies and is closely tied to our senses and previous experience, we will come to create the world in ways that are unique to ourselves. Thus, knowledge is not universal . . . [48]

In his well-known book on constructivism, Ernst von Glasersfeld, one of the key theorists of the constructivist perspective, writes:

> The other [constructivist] orientation has focused on the general human question concerning knowledge and, placing it within the conceptual framework of self-organization, has produced, on the one hand, a comprehensive biology of cognition in living organisms (Maturana and Varela, 1980) and, on the other, a theory of knowledge construction that successfully avoids both the absurdities of solipsism and the fatal contradictions of realism.[49]

Elsewhere, Glasersfeld reiterates:

---

[46] Davenport and Prusak, *Working Knowledge*, p. 4.
[47] Davenport, et al., "Improving Knowledge Work Processes," p. 54.
[48] Krogh, "Care in Knowledge Creation," p. 134. See also Jyrämä, Annukka, and Anne Äyväri, "Can the Knowledge-Creation Process Be Managed? A Case Study of an Artist Training Project," *International Journal of Arts Management*, vol. 7, no. 2 (2005), pp. 4–14; p. 6.
[49] Ernst von Glasersfeld, *Radical Constructivism: A Way of Knowing and Learning* (London: The Falmer Press, 1995), p. 148. See also Heinz von Foerster, (1973) "On constructing a reality"; Ernst von Glasersfeld, "Cybernetics and cognitive development," *Cybernetics Forum*, vol. 8 (1976), pp.115-20; McCulloch, "Embodiments of Mind."

> Knowledge can now be seen as something which the organism builds up in the attempt to order the as such amorphous flow of experience by establishing repeatable experiences and relatively reliable relations between them. The possibilities of constructing such an order are determined and perpetually constrained by the preceding steps in the construction.[50]

The recognition of the role of subjectivity in knowledge acquisition has undermined the mode of knowledge validation that appeals to observations. The disinterested and detached nature of observation itself has become suspect. Both constructivists and organizational theorists have to rely on the method of knowledge validation that conforms to their conception of knowledge as "dynamic, relative, unstable, and person dependent." Their solution recognizes utility of knowledge as the primary basis for its validation.

Glasersfeld, for example, advocates the adoption of the term "viability" borrowed from biology. He explains:

> Thus, in the constructivist way of thinking, the concept of viability in the domain of experience, takes the place of the traditional philosopher's concept of Truth, that was to indicate a `correct' representation of reality. . . . Radical constructivism is uninhibitedly instrumentalist. It replaces the notion of 'truth' (as true representation of an independent reality) with the notion of 'viability' within the subjects' experiential world. Consequently it refuses all metaphysical commitments and claims to be no more than one possible model of thinking about the only world we can come to know, the world we construct as living subjects. Because this is a difficult and shocking change of attitude when one first comes to it, I want to reiterate once more that it would be misguided to ask whether radical constructivism is true or false, for it is intended, not as a metaphysical conjecture, but as a conceptual tool whose value can be gauged only by using it.[51]

Krogh's summary of constructivist mode of knowledge validation echoes a similar theme:

> . . . the constructionist does not pay much attention to comparing various representations. Rather, she knows that the cognitive system works when knowledge allows for effective action.[52]

William Hall concurs: "To the constructivist, concepts, models, theories, and so on are viable if they prove adequate in the contexts in which they were created."[53]

---

[50] Ernst von Glasersfeld, "Introduction to Radical Constructivism," http://www.cesipc.it/wp-content/uploads/2014/02/vG1.html (accessed February 4, 2016), p. 16.
[51] Glasersfeld, *Radical Constructivism*, pp. 14 and 22.
[52] Krogh, "Care in Knowledge Creation," p. 134.
[53] William P. Hall, "A Biological Theory of Knowledge and Applications to Real World Organizations," https://www.academia.edu/266520/A_biological_theory_of_knowledge_and_applications_to_real_world_organizations (accessed May 29, 2014), p. 7.

For Nonaka and other knowledge creation theorists, the value of knowledge lies primarily in the extent to which it proves "worthwhile" for the organization and society. Nonaka's criteria, or standards, for knowledge justification are very broad and include cost, profit margin, and the degree to which a product can contribute to the firm's development; but also such subjective factors as "value premises that transcend factual or pragmatic considerations." According to Nonaka, these latter might be "opinions about such things as the extent to which the knowledge created is consistent with the organization's vision and perceptions relating to adventure, romanticism, and aesthetics."[54] In other variations on the same theme one learns that knowledge justification "hinges on unique viewpoints, personal sensibility and experience" and that the proof of the validity of knowledge lies in "the introduction of successful products and services, thus generating new knowledge for customers."[55]

The perspectives on knowledge and knowledge validation by constructivists and knowledge creation theorists are not without merit. They certainly make an effort to integrate modern sensibilities regarding subjectivity and its role in knowledge creation. But they are also not without problems. For one thing, their rejection of objectivism and realism has hardly gained universal acceptability. Also, neither constructivists nor organizational theorists have adequately responded to the extensive body of literature that goes back to Nietzsche and Popper and that critiques both the utilitarian and the instrumental approaches to knowledge and truth.[56] As attractive as instrumental and utilitarian approaches may be from a pragmatic point of view, one can hardly accept them as the exclusive criteria of knowledge and truth.

Finally, the approach to knowledge production by both the constructivists and knowledge creation theorists is rather limited. While the former narrow their discussion to the general area of education, the latter focus on issues and problems related to organizational and institutional contexts. Both sides do not extend their perspectives to broader societal dimensions. For example, they do not attempt to bring into their discourse such broad concerns as issues of power, freedom, gender, class, race, and others that are centrally relevant to society as a whole, which makes their theoretical contributions rather narrow in application. The fact has not escaped the attention of researchers. Barbara Simpson and Christine Woods, for example, note that "issues of power . . . are frequently overlooked in theories of organization."[57]

---

[54] Nonaka, "A Dynamic Theory of Organizational Knowledge Creation," p. 26.
[55] Nonaka, et al., "Organizational Knowledge Creation Theory," pp. 1181, 1184, and 1199. See also Nonaka and Takeuchi, *The knowledge-creating company*.
[56] Stathis Psillos, *Scientific Realism: how science tracks truth* (London: Routledge, 1999); Margaret A. Boden, *Mind as Machine* (Oxford: Clarendon Press, 2006), pp. 1177–78; Gürol Irzik, "Back to Basics: A Philosophical Critique of Constructivism," *Studies in Philosophy and Education*, vol. 20 (2001), pp. 157–75.
[57] Barbara Simpson and Christine Rachel Woods, "Knowledge Creation: Systems Thinking or Process Paradigm," https://www.researchgate.net/publication/253988011_KNOWLEDGE_CREATION_SYSTEMS_THINKING_OR_PROCESS_PARADIGM (accessed February 1, 2016), p. 10.

The above discussion shows that although much has been learned about knowledge creation/construction over the last few decades, our understanding of the process remains limited. Understanding knowledge creation is crucial for our economy and society. As Peter Drucker wrote in 1978, "To make knowledge work productive will be the great management task of this century, just as to make manual work productive was the great management task of the last century."[58] Yet, an understanding of this process still eludes us. The process of knowledge creation remains largely unmanageable. Also, as research in this area has expanded, new problems have emerged that also require resolution. Why problems in understanding the process of creation persist? Why, despite the constant emphasis on the need to control this process, is our capacity to manage it still negligible? What can we do to solve these problems?

It is in this respect that a broader approach involving the process of creation in general may prove to be useful. Our capacity to create knowledge has emerged as a result of the evolution of reality. The creation of new levels and forms of organizing reality is at the very core of the evolution. Knowledge creation is a product of this general process of creation and, naturally, it inherits many of its features from this process. Knowledge creation is a particular case of the more general process of creation of new levels and forms of organization of reality. When we study knowledge creation, we focus on a specific product of the process of creation, its particular manifestation. Our efforts to understand knowledge creation apart from the more general process of creation in which it is rooted may be one important factor that prevents us from having a comprehensive understanding of knowledge creation. It is quite logical to suggest that looking at the general underlying process of creation of new levels and forms of organization of reality may help us to gain a better understanding of knowledge creation. Also, this broader context may help resolve the specific problems that have arisen in connection with knowledge creation. So let's reiterate some of the key points covered earlier.

As the discussion in Chapter Two has stressed, conservation is at the heart of the process of creation that operates in the real world. As has also been pointed out earlier, action, activity is the most essential condition for conservation. When action is performed, the entity, or system, that performs this action is conserved. The more a system is activated the better it is conserved. Activation requires a mechanism, or operation, that triggers action. In order to activate the system, this mechanism, or operation, should be able to identify those elements in the environment that can sustain the functioning of the system and establish the connection between the system and these elements. In order to perform its function, this activating mechanism should "know" how the entire system and all its subsystems function. Thus this function should be capable of reflecting on the entire system. It should also be capable of connecting the system to its environment—that is, to what the system is not. Therefore, its operational capacity should transcend the boundaries of the system.

This mechanism that regulates the functioning of the system and its subsystems is created in the course of the formation of the system. When subsystems connect with each other, they combine their own regulatory operations and form a common regulatory mechanism. Such combination essentially represents multiplication, or operation on operations. Multiplication is a more powerful operation than addition. That is why the

[58] As quoted in Davenport et al., "Improving Knowledge Work Processes," p. 53

combinatorial power of the system's regulatory operation exceeds the power of its components; it can perform more operations that each subsystem involved in its formation or their sum total. A regulatory operation reflects the system it regulates, or, in other words, it "knows" what the system "knows." But it also "knows" what the system is not, that is, it "knows" negation. The "knowledge" of negation constitutes special power of regulation. Thus regulation represents the level of organization that is more powerful than the level of organization of the entities that compose the system. The creation of the regulatory operation represents the emergence of a new and more powerful level of organization, the level that has not existed prior to integration of subsystems. It is a true act of creation.

But the process of creation does not stop with the emergence of regulation. The law of conservation applies to regulations as much as it applies to any other operation. Conserving regulatory operations, just like conserving any other operation or system, requires activation. In other words, regulatory operation also requires activation, which means that it has to connect to other entities in its environment that can trigger it into action.

In the case of regulatory operations, the environment includes other systems, as well as subsystems of the system that such operations regulate. By connecting to other systems in its environment, the regulatory operation enriches itself and the system it regulates. In other words, systems evolve by connecting to other systems in the process of self-organization.[59] When systems form permanent connections with each other, they become subsystems of a new totality that they have created.

As has been explained in Chapter Two, the regulatory operation and the subsystems of the system it regulates represent two different levels of organization. The conservation of the system and all of its functions requires the integration of these two levels of the hierarchical structure. In other words, it requires the integration of the level of organization of the regulatory operation, or the global level, and the level of organization that supports local interactions among subsystems. In order to integrate the regulatory operation with the subsystems it regulates, the level of its organization should be expressed in terms of the level of organization of the subsystems.

The representation of a more powerful level of organization in the terms of the less powerful one requires reflective codification that leads to the creation of a level of organization that is capable of including both the level of local interactions and the global level as its particular cases, which means that its power should exceed the power of both levels. As has been pointed out, this operation is similar to the one used by Gödel in proving his famous theorem of consistency and completeness when Gödel invented the way to translate arithmetical formulas in terms of numbers. The integration of the two different levels of the system results in the emergence of another level of organization that exceeds the power of both levels that it integrates and therefore is capable of regulating them both.

---

[59] Ilya Prigogine and Isabelle Stengers, *Order Out of Chaos: Man's New Dialogue With Nature* (Toronto; New York: Bantam Books, 1984); Stuart A. Kauffman, *Origins of Order: Self-Organization and Selection in Evolution* (Oxford: Oxford University Press, 1993); Peter A. Corning, Synergy and self-organization in the evolution of complex systems. *Systems Research*, vol. 12, no. 2 (1995), pp. 89–121; Niklas Luhmann, *Social Systems* (Stanford: Stanford University Press, 1995); John A. Buck and Gerard Endenburg, *The Creative Forces of Self-Organization* (Sociocratic Center: Rotterdam, Netherlands, 2010).

This act of creation gives rise to the new regulatory mechanism. Thus the conservation of the regulatory operation through its connection to external systems and through integration of the two hierarchical levels of organization of the system creates new level of organization of reality and opens the path to the further evolution of the system.

The interplay between conservation and regulation is the most fundamental mechanism that drives the process of creation. This process is also sustained by a number of dynamic balances. One of these balances is the equilibrium between equilibrium and disequilibrium. As has been explained in Chapter Two, when the equilibrium on the level of local interactions grows, so does the disequilibrium that the global level creates. When the equilibrium on the level of local interactions of the system reaches its maximum, so does the disequilibrium between the local and the global level of the system. As subsystems adapt to the more powerful level, they become more powerful, which leads to differentiation and consequently, increase in disequilibrium on the level of local interactions, which, in turn, requires re-equilibration. And so the system enters a new stage in its evolution. This constant balance between equilibrium and disequilibrium sustains the dynamism of the process of creation, just like the balance between equilibrium and disequilibrium allows us to walk.

Another important balance that is crucial for the process of creation is the balance between hierarchical and non-hierarchical interactions. Both types of interactions are essential for the process of creation and further evolution of the system. Local interactions among the subsystems are non-hierarchical. The result of these interactions is the creation of a new and more powerful level of organization. In other words, these local interactions create a global level and hence hierarchy. The conservation of the system that consists of two different levels of organization—one more powerful than the other—requires integration of these two levels. Only non-hierarchical interactions can lead to such integration. So, how can the two levels that are so different engage in non-hierarchical interactions? Reflective coding makes this possible.

When local operations adapt to the global level, operations on the global level become encoded and can be expressed in terms of the level of local interactions. For example, sensory-motor operations that control hand movements adapt to mental representations of objects, which leads to the adjustment of hand movements that express mental images in terms of the movements of the hand. The capacity of the neural organization to reflect on itself makes possible to construct the level or organization that is capable of reflecting both the global and local operations at the same time. In other words, it creates the level of organization that exceeds the power of both the local and the global level and it incorporates both as its particular cases. Gödel has demonstrated the use of such reflective coding.

Jean Piaget has shown that our capacity to create symbolic constructs has emerged in the course of the evolution from the level of organization of biological and physiological functions. This capacity represents the level of organization that is more powerful—that is, capable of performing greater number of operations—than the level of organization from which it has emerged. Therefore, our capacity to construct symbolic operations is merely another form of the general process of creation that lies at the core of the evolution of our universe. It is merely a continuation of this process. And the evolution of this process does not stop with the emergence of the level of symbolic

operations. On the contrary, this level of organization opens infinite possibilities for the evolution of the process of creation. It leads to social and cultural evolution, creation of language as a means of conserving mental constructs by allowing individuals to connect their mental constructs and create powerful inter-subjective forms of organization.

Since symbolic creations represent the most powerful level of organizing reality, our capacity to perform this type of creation serves a variety of purposes useful to us, such as survival or knowledge acquisition. But neither survival nor acquisition of knowledge is the primary purposes of this process. The drive that propels this process resides within it, not outside of it. Conservation provides the principal impetus for creation. It is this drive to conserve that leads to the creation of new and increasingly more powerful level of organization of reality. As has been repeatedly mentioned, our mind can create an infinite number of new levels of organizing reality. We can always construct another operation that regulates existent operations. In fact, in order to conserve our current level of organization we must construct a new and more powerful one. In other words, in order to conserve themselves, systems must evolve. There is not conservation without evolution. It is impossible for systems to survive by trying to maintain a status quo. If systems, including human systems, do not evolve, they begin to disintegrate and the whole process of evolution is reversed.

One can draw several conclusions relevant to knowledge production from the above brief recapitulation of the main points regarding the process of creation in general. First of all, it shows that knowledge creation is merely one of the forms of the process of creation. Just like the process of creation from which our capacity to know—that is, establishing one-to-one correspondences between our mental constructs and reality—has emerged, knowledge creation is primarily about constructing new levels and forms of organization—in this case, the organization of our consciousness. Moreover, since our mind represents the most powerful organization of reality, all its constructs are more powerful than anything that exists in nature; and our mind's capacity to construct the new levels and forms of organization is infinite.

What we consider to be knowledge is essentially a one-to-one correspondence between constructs of our mind and reality. Since our constructs represent the most powerful level of organization, we can always establish a one-to-one correspondence between them and reality. Underdetermination—that is, the condition when several theoretical constructs explain the same set of physical data—is a vivid proof of this power.

Contrary to the current perspectives on knowledge production, the fact that we can produce many representations that have one-to-one correspondence to reality does not mean that objective knowledge is not possible. Indeed, as has been argued earlier in Chapter Seven, the subject and the object are not ontologically separate. They are both products of the same process of creation. Therefore, the very separation of the subject from the object—and therefore, the subjective from the objective—is merely analytical. However, this fact does not have to imply that objectivity is impossible.

As has been argued elsewhere,[60] the most important condition of objectivity is the inclusion of the knower into the act of knowing. The perspective that incorporates the process of creation into its frame of vision allows such inclusion. As has been explained, the process of creation has a regulatory operation that balances this process around the

[60] Shkliarevsky, "The paradox of observing"; see also Shkliarevsky, "Science and Its Discontents."

point of equilibrium between equilibrium and disequiblibrium. Since regulation allows reflection, we can reflect on the process of creation and thus include our own creative activity as knowers into the product of this activity—our knowledge constructs. Also, the production of knowledge is infinite, while the specific objects of reality are finite. Therefore, it is possible that our mental constructs with their infinite possibilities will provide an exhaustive description of objects that despite their complexity are ultimately finite.[61]

The perspective on knowledge production that focuses on the process of creation helps us understand this process better. This understanding is essential for establishing control over this process, managing it better, and making it more efficient. Since in accordance with this perspective, knowledge production depends on the process of creation of new levels and forms of organization, this process should be the main focus in our knowledge production practice. Only the continued evolution of this process, the steady creation of new and increasingly more powerful levels and forms of organization of reality will ensure a steady supply of new and more powerful theories and ideas. Therefore, making sure that the process of creation continues to evolve, that new and more powerful levels of organization are generated is essential for the steady production of new knowledge.

As has been indicated earlier, the process of creation works on inclusion of differences. The more inclusive a particular level of organization is, the more powerful it is. Therefore, inclusion of differences, not consensus as advocated by organizational knowledge theory, should be the main principle in validating knowledge. The more possibilities a perspective or a theory includes, the more valuable it is. Let's take the example of Euclidean and non-Euclidean geometry to illustrate this point. Even though both geometries are valid, non-Euclidean geometry is more inclusive since it includes Euclidean geometry as its particular case when space curvature is equal to zero. Hence non-Euclidean geometry is more valuable for knowledge creation, even though for specific practical applications (for example, building a house) one may choose to use Euclidean geometry.

The process of creation, and knowledge production as its particular form, are, first and foremost, about creating new and increasingly more powerful levels and forms of organization. The increasingly more powerful levels of organization that we produce offer us more possible courses of action from which we can choose the most appropriate for our purpose or create new ones by combining them. The more options are available to us the greater power we enjoy. This observation suggests that there is a direct connection between the process of construction and the issue of power that other theoretical perspectives on knowledge creation have avoided. The connection between knowledge creation and power makes possible to apply the perspective that focuses on the process of construction to the social and political sphere—something that the current perspectives on knowledge production do not offer—where concerns for inclusion and differences are of vital importance.

[61] Shkliarevsky, "Of Cats and Quanta," p. 33.

CHAPTER NINE

RESTRUCTURING THE PUBLIC SPACE: THE NEW DEMOCRATIC PRACTICE

This volume has repeatedly stressed the importance of the process of creation and its vital role in evolutionary processes, including the evolution of our civilization. It has also pointed out that despite the importance of the process of creation, the paradigms that dominate our civilization and are used for organizing many aspects of our life pay little attention to this process. The exclusion of such important part of reality from our frame of vision has had profound effects on the way we organize our practices—from politics to economics, to our relationship with nature, our social relations, culture, science, and much more. The general conclusion that follows is quite obvious: we cannot ignore the process of creation. It is too important. The need of our society in new creations is constantly growing. As a much-quoted *Newsweek* article has pointed out, despite many advances and innovations, our society constantly experiences a severe shortage of creative solutions and approaches.[1] There is only one way we can satisfy this acute demand: it is to constantly and systematically enhance and foster creativity. Given the importance of the process of creation, we should make it the central principle for organizing our practices.

Although there is still much that we need to learn about the process of creation, the preceding chapters provide some general idea of how it functions. But what practical applications does this knowledge have? In what ways will the adoption of the process of creation as the main principle for organizing our life affect our most important practices?

No one individual can answer these questions exhaustively. Answering them will require the involvement of many people who will engage both in bold theoretical work and practical experimentations. This book represents but one step of many that need to be taken. It will not attempt to give all the answers and provide all the details but merely outline some general effects that the new paradigm will have on our main practices.

Inclusion, Empowerment, and Democracy

As has been explained in the preceding chapters, systems evolve by forming structural connections with other systems, thus creating new organized totalities. Such structural connections involve the combination of two operations—assimilation and adaptation. Assimilation integrates the environment (essentially other systems) into the functional operations of a system. Adaptation accommodates the functional operations of a system to its environment (that is, to functional operations of other systems in its environment). The bond formed as a result of such couplings creates a new totality that combines powers and capabilities of each system that forms this totality. Thus inclusion plays an important role in the process of creation. The logical conclusion that follows is that inclusion should also play an important role in the creative social and political practices in human systems.

The subject of inclusion occupies a prominent place in our public discourse. It is invoked in a variety of contexts: in promoting equality for women, advancing the rights of racial and ethnic minorities, protecting the interests of the disadvantaged and the poor. Inclusion is an essential part of our political process, as political parties seek to expand

[1] Po Bronson and Ashley Merryman, "The Creativity Crisis," Newsweek, July 10, 2010.

their base and widen their appeal. We usually understand inclusion as having access to power, power sharing, and empowerment. As individuals and members of groups, we all seek empowerment to advance our interests and defend our rights. For this reason, inclusion has a singularly important place in our public life.

There are two basic ways in which we think about inclusion. One way is to associate inclusion with agreement, accord, common understanding, or consensus. This view of inclusion presupposes diminishing or eliminating differences and emphasizing commonalities. Nonaka, for example, stresses commonalities in his conception of the creation of knowledge in organizations. He writes: "Constructive criticism substantiated by reasoned arguments should be used to build a consensus."[2] Jürgen Habermas also emphasizes consensus in his theory of communicative action. Describing communicative rationality in his magisterial work *Communicative Action* Habermas writes:

> [C]ommunicative rationality carries with it connotation based ultimately on the central experience of the unconstrained, unifying, consensus-bringing force of argumentative speech, in which different participants *overcome their merely subjective views* and, owing to the mutuality of rationally motivated conviction, assure themselves of both the unity of the objective world and the intersubjectivity of their lifeworld.[3]

Another way of understanding inclusion is to think of it in pluralist terms. In this case differences are not eliminated or diminished but coexist. This view is characteristic for feminist or multicultural perspectives that, for example, view inclusion as a kind of aggregation of and respect for differences.[4]

The two ways of reading inclusion are largely mutually exclusive. Those who view inclusion in terms of consensus—as Habermas and Nonaka do—emphasize commonalities and seek to diminish differences. Their opponents claim that consensus is merely a form of hegemonic domination and underscore—as, for example, feminists, multiculturalists, or the proponents of agonistic democracy do—the importance of differences. They advocate pluralism and coexistence of different points of view and opinions.

As the discussion of the process of creation in this volume shows, this process does not work on commonalities; neither does it work on eclectic aggregation of differences. This study demonstrates that differences play a very important and productive role in the evolution of reality. The process of creation does not suppress or eliminate differences; nor does it assemble them in eclectic aggregations. It conserves

---

[2] Ikujiro Nonaka, "A Dynamic Theory of Organizational Knowledge Creation," *Organization Science*, vol. 5, no. 1 (1994), pp. 14–39, p. 25.

[3] Jürgen Habermas, *The Theory of Communicative Action, Volume 1: Reason and the Rationalization of Society* (Boston: Beacon Press, 1984), p. 10 (emphasis added).

[4] Mojca Pajnik, "Feminist Reflections on Habermas's Communicative Action The Need for an Inclusive Political Theory," *European Journal of Social Theory*, vol. 9, no. 3 (August 1, 2006), pp. 385–404; Mary G. Dietz, "Working in Half-Truth: Some Premodern Reflections on the Partisanship of Political Speech," paper presented at the Annual Meeting of the American Political Science Association, San Francisco, 29 August–1 September, 1996.
Jean L. Cohen, "Critical Social Theory and Feminist Critiques: The Debate with Jürgen Habermas," in Johanna Meehan, ed., *Feminists Read Habermas: Gendering the Subject of Discourse* (New York: Routledge, 1995), p. 57; Dennis A. Gioia and Evelyn Pitre. "Multiparadigm Perspectives on Theory Building," *Academy of Management Review*, vol. 15, no. 4 (October 1, 1990), pp. 584–602.

them as particular cases in the increasingly more powerful levels and forms of organization.

The early development of children analyzed by Piaget[5] is a good illustration. Initially, the reflexive functions with which children are born—visual, audio, tactile, gustatory, and olfactory—are incommensurable; in other words, they have nothing in common, other than the fact that they belong to the same child. Combinations of these incommensurable functions into new totalities do not eliminate their differences. On the contrary, mental images that are created as a result conserve these differences in new and more powerful forms of organization. The audio and the visual function initially have nothing in common and function totally independently of each other. They each have their own specific activators: photons of light and sound waves. Subsequently, the child coordinates these two functions and eventually connects them, that is, the child begins to "see," when s/he hears, and "hear," when s/he sees. When the two functions are combined, they are activated twice as often in comparison to their prior state. As a result, each function is twice as active than before and, therefore, is much better conserved. The mode that improves conservation is naturally selected for fitness.

This advance in child's behavior is not a product of integration on the basis of commonalities (as has already been stated, the two functions have nothing in common); it is a result of the integration of their differences. This integration is clearly different from "consensus-seeking." It creates a new and more powerful level of organization that conserves differences and integrates less powerful forms (in this case, the audio and the visual function) as its particular cases. It conserves differences, rather than discards them.

It is worth noting that the assertion by the critics of the Enlightenment that the problem of domination is in principle irresolvable is also due to their failure to recognize the importance of the process of creation. The agonistic perspective of Ernesto Laclau and Chantale Mouffet—perhaps the two most visible critics of the Enlightenment and Habermas—is a good case in point. In contrast to consensus-oriented Enlightenment perspectives that seek to diminish and reconcile differences, Laclau and Mouffet see differences as ultimately incommensurable and irreconcilable. Both reject the Enlightenment tradition. In their view, contestation of hegemonic rule is intrinsic to democratic practice; and such contestation inevitably involves exclusions.

It is beyond the scope of this study to offer a detailed critique of the agonistic perspective. Suffice it to say, however, that the inevitability of exclusion that the agonists see certainly indicates that domination will also remain a necessary part of democratic practice, even if designated by a more benign term "hegemony." The fact that, in their vision, domination remains a part of democratic practice suggests that Laclau, Mouffet, and other critics of the Enlightenment also fail to embrace the importance of the process of creation. Their model is much more about domination, or hegemony as they call it, than about power creation and liberation in the sense that has been described in this study and that necessarily involves universal inclusion and empowerment.[6]

---

[5] Piaget, The Origin of Intelligence in Children.

[6] Ernesto Laclau and Chantal Mouffe, *Hegemony and Socialist Strategy: Towards a Radical Democratic Politics* (London: Verso, 2001).

Thus, in the area of social and political practice, post-structuralism can offer little more than agonistic competition for domination that ultimately fails to conserve difference and achieve emancipation. As this study has argued, the only way to conserve differences is to construct new and more powerful levels of organization that would include differences as particular cases. Conserving differences requires an act of creation. Yet, just like the Enlightenment tradition, post-structuralism does not grasp the close interrelationship between equilibration and the production of disequilibrium, which results in its failure to embrace the process of creation; and without this process, differences cannot be conserved and, as Laclau and Muffet perceptively note, full emancipation cannot be attained.

As has been argued elsewhere,[7] the process of creation is also a system. It is a system that includes other systems; in fact, it includes all possible systems, levels and forms of organization—past, present, and future. It creates new and increasingly more powerful possibilities. In other words, this process creates power; it is empowering. Thus, the process of creation is the source of our power.

If inclusion is the source of power, then by excluding differences, we diminish the amount of power that can be available to us. The result of such exclusion is disempowerment and domination. Power and domination have nothing in common. They are actually opposed to each other.

The differentiation of power from domination is nothing new. Hannah Arendt draws a distinction between "power over" (domination) and "power to"—the term she reserves for emancipatory practice. Feminist theoreticians make a similar distinction.[8] So does Anthony Giddens when he differentiates domination as structural power relevant to institutions from power as an emancipatory capacity of human agents.[9] Robbie Kahn notes that among critical theorists the word "domination" does not carry the same meaning as power.[10] Many other theoreticians of power also differentiate power from domination.[11] In some sense, Habermas's concepts of communicative and instrumental power also convey this difference.

Even though many draw the distinction between power and domination, they still preserve the connection between the two. This situation creates a great deal of confusion

---

[7] Shkliarevsky, "The Paradox of Observing, Autopoiesis, and the Future of Social Sciences."

[8] See, for example, Amy Allen, "Feminist Perspectives on Power" in *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta, Summer 2014, http://plato.stanford.edu/archives/sum2014/entries/feminist-power/ (accessed May 14, 2015); Amy Allen, "Reason, Power and History Re-Reading the Dialectic of Enlightenment," *Thesis Eleven*, vol. 120, no. 1 (February 1, 2014), pp. 10–25.

[9] Anthony Giddens, *Central problems in social theory* (Berkeley: University of California Press, 1979), p. 91.

[10] Kahn, "The Problem of Power in Habermas," p. 363.

[11] Mark Haugaard, "Rethinking Power," SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, August 21, 2011), http://papers.ssrn.com/abstract=1913739 (accessed April 23, 2015); Guido Parietti, "On the Concept of Power (APSA 2013)" https://www.academia.edu/4285670/On_the_Concept_of_Power_APSA_2013 ((accessed April 23, 2015); Angus Stewart, *Theories of Power and Domination : The Politics of Empowerment in Late Modernity* (London: Sage Publications, 2000); Gary G. Hamilton and Nicole Woolsey Biggart, "Why People Obey: Theoretical Observations on Power and Obedience in Complex Organizations," *Sociological Perspectives*, vol. 28, no. 1 (January 1, 1985), pp. 3–28; Ian Shapiro, *The State of Democratic Theory* (Princeton, N.J: Princeton University Press, 2003), p. 4.

in the current literature where domination is frequently regarded as a subset of power and is often referred to as "power over"—a qualified form of power. Amy Allen, for example, writes:

> Power-over, power-to, and power-with are not best understood as distinct types or forms of power; rather, they represent analytically distinguishable features of a situation. All features may be present in one interaction: an action that involves power-with, which presupposes power-to, may also be used as a means to achieving power over others.[12]

Habermas also does not avoid this confusion. His distinction between administrative and communicative power still refers to the same genus of power. Guido Paretti has noted this fact in his remark that Habermas's term "administrative power" is confusing and tantamount to oxymoron.[13]

The theoretical perspective that centers on the process of creation removes this confusion. In this perspective, power and domination cannot be any more different. They belong to totally different species. The process of creation integrates differences and thus generates power. Domination works completely differently. It works on exclusion. And exclusion leads to disempowerment. Exclusion diminishes the total number of available possibilities—hence the total amount of power—that could be otherwise generated through inclusion. Domination does not generate power. On the contrary, it diminishes power. One cannot but agree with the following reflections by Guido Parietti:

> Therefore, even though "power over" (potestas, domination, etc.) remains logically dependent on "power to," it is possible to have an excess of domination with no corresponding power. This decoupling of domination from power also allows us to appreciate how Arendt's notorious equivalence of power with freedom, to which some recent analytic philosophy came surprisingly close, could appear as plain and obvious as it indeed is. Examples of the decoupling of domination from power need not to be purely hypothetical. Totalitarianism, as described by Arendt, is a case in point. There would be little power in totalitarianism—even zero in its perfected actualization, which would be a worldwide concentration camp.[14]

The exclusion of people and ideas inhibits the process of creation and reduces power that could be otherwise produced by integrating differences into new and more powerful totalizations. The power generated by the process of creation offers new possibilities and new choices that enhance our freedom. It is for this reason, as some argue, that power is integrally connected with freedom, while exclusion and domination are not.[15]

---

[12] Amy Allen, "Rethinking Power," *Hypatia*, vol. 13, no. 1 (January 1, 1998), pp 21–40, p. 37.
[13] Parietti, "On the Concept of Power," p. 22.
[14] Parietti, "On the Concept of Power," p. 21; for a similar assessment, see also J. R. Searle, *Construction of Social Reality* (New York: Free Press, 1997), 117-18.
[15] Peter Morriss, "What Is Freedom If It Is Not Power?" *Theoria: A Journal of Social & Political Theory*, vol. 59, no. 132 (September 11, 2012), pp. 1–25; Pamela Pansardi, "Power and Freedom: Opposite or

Since exclusion and domination do not produce power, they cannot compete with inclusion that generates power. By enhancing the process of creation and generating more power through inclusion, the new social and political practice can eliminate exclusion and domination. The above argument suggests that the new social and political practice should recognize the crucial distinction between domination and power as two totally different species. We should embrace the process of creation as the process that empowers all and incorporate it into our frame of vision. This process should become the main principle in organizing our social and political practice.

When we exclude the process of creation from our frame of vision, we focus entirely on a particular product or products of this process to the exclusion of all others. Such exclusion opens the path to domination. And domination makes the process of evolution more difficult, less efficient, and wasteful. Instead of conserving the process of creation, we try to conserve its specific products. The focus on the process of creation works against the preoccupation with conserving any specific product. With the focus on the process, we will be less likely to absolutize specific constructs at the expense of the process. We will try to conserve the process first and foremost, which is the only realistic way to conserve its creations. The process of creation, its unimpeded and uninterrupted evolution as the source of our power, should be our main preoccupation, the most important product by which we should judge our practice. We must unshackle the process that increases our power and realizes our potential. Since the process of creation works on inclusion and empowerment, the greater the number of people who are empowered and engaged in the process of creation the more powerful we all are. The broader our approach toward empowerment and inclusion is the more powerful we all as a society are going to be.

The New Democratic Practice of Universal Empowerment

As has been discussed earlier, the operation of the process of creation involves several important balances. One of them is the balance between hierarchical and non-hierarchical interactions. While the non-hierarchical interactions create new levels and forms of organization, hierarchical interactions optimize and conserve them. Both types of interactions are essential for the successful evolution of human systems.

The need to balance hierarchical and non-hierarchical interactions raises an interesting problem of the relationship between civil society and those in the position of leadership (political, economic, or other). Civil society is the principal domain where unfettered interactions among free and equal individuals take place. Formed by entangled networks of citizens, the civic sphere provides a common space where citizens exchange ideas, views, and opinion. It is here that they have an opportunity to engage in constructing new levels and forms of organization of reality, thus affirming and enhancing their creative capacity. This affirmation is the source of their empowerment. A social and political practice that embraces the process of creation necessarily elevates the role of the civic sphere. Indeed, as the principal source of opinion and will formation, civil society should constitute the real foundation of the new social and political practice.

As follows from the discussion in Chapter Four, such enhanced role of non-

---

Equivalent Concepts?" *Theoria: A Journal of Social & Political Theory*, vol. 59, no. 132 (September 11, 2012), pp. 26–44.

hierarchical civil society as the principal domain of political opinion and will formation does not eliminate the role of hierarchies. Political parties and leaders have a legitimate role to play in the creative process. This role will have nothing in common with elite rule and domination. On the contrary, as free and equal citizens, leaders will be fully involved in the process of universal empowerment, rather than asserting their dominant position.

The orientation of the new social and political practice toward universal inclusion and empowerment resonates with a variety of the current perspectives that have become increasingly popular and vocal lately in connection with what many perceive as the growing deficit of democracy in our civilization.[16] These perspectives (such as, deliberative, direct, and participatory democracy) critique liberal democratic theory and the elitist practices of modern representative democracies. They also advocate a broad empowerment of citizens and their inclusion into the process of democratic decision-making.[17]

Demands for broad empowerment and inclusion are not unproblematic. They raise a number of important theoretical and practical issues of how to combine broad participation of citizens in decision-making with the continued existence of leadership and hierarchies. These issues have been examined in detail elsewhere[18] and need not be revisited here. There is one issue, however, that should be addressed: Is the continued existence of hierarchies an impediment to universal empowerment of citizens and their broad involvement in formulating perspectives and decisions that guide our society? Are there forms of organization that would allow hierarchical and non-hierarchical interactions to function in harmony?

---

[16] Tina Nabatchi. "Addressing the Citizenship and Democratic Deficits: The Potential of Deliberative Democracy for Public Administration," *The American Review of Public Administration*, vol. 40, no. 4 (July 1, 2010), pp. 376–99; Russel J. Dalton, Susan E. Scarrow, and Bruce E. Cain, "Advanced Democracies and the New Politics," *Journal of Democracy*, vol. 15, no. 1 (2004), pp. 124–38; Jonathan Bowman, "The European Union Democratic Deficit Federalists, Skeptics, and Revisionists," *European Journal of Political Theory*, vol. 5, no. 2 (April 1, 2006), pp. 191–212; Daniel Innerarity, "What Kind of Deficit? Problems of Legitimacy in the European Union," *European Journal of Social Theory*, vol. 17, no. 3 (August 1, 2014), pp. 307–25; Richard S. Katz, "Models of Democracy: Elite Attitudes and the Democratic Deficit in the European Union," *European Union Politics*, vol. 2, no. 1 (February 1, 2001), pp. 53–79.

[17] David Marcus, "The Horizontalists," *Dissent*, Fall 2012; Cohen and Rogers, "Power and Reason," pp. 237–55; Janette Hartz-Karp and Michael K. Briand, "Institutionalizing Deliberative Democracy," *Journal of Public Affairs*, vol. 9, no. 2 (May 2009), pp. 125–41; Paul Healy, "Rethinking Deliberative Democracy: From Deliberative Discourse to Transformative Dialogue," *Philosophy & Social Criticism*, vol. 37, no. 3 (March 2011), pp. 295–311; Seong-Jae Min, "Occupy Wall Street and Deliberative Decision-Making: Translating Theory to Practice," *Communication, Culture & Critique*, vol. 8, no. 1 (March 1, 2015), pp. 73–89; Clifford Shearing and Jennifer Wood, "Nodal Governance, Democracy, and the New 'Denizens,'" *Journal of Law and Society*, vol. 30, no. 3 (2003), pp. 400–419; Denise Vitale, "Between Deliberative and Participatory Democracy: A Contribution on Habermas," *Philosophy & Social Criticism*, vol. 32, no. 6 (September 1, 2006), pp. 739–66; Mark E. Warren, "What Should We Expect from More Democracy?: Radically Democratic Responses to Politics," *Political Theory*, vol. 24, no. 2 (May 1, 1996), pp. 241–70; Russell J. Dalton, Wilhelm P. Burklin, and Andrew Drummond, "Public Opinion and Direct Democracy," *Journal of Democracy*, vol. 12, no. 4 (2001), pp. 141–53; Pippa Norris, *Democratic Deficit: Critical Citizens Revisited* (Cambridge: Cambridge University Press, 2011); Francesca Polletta, "Participatory Democracy in the New Millennium," *Contemporary Sociology*, vol. 42, no. 1 (January 2013), pp. 40–50; Arthur Lupia and John G. Matsusaka, "Direct Democracy: New Approaches to Old Questions," *Annu. Rev. Polit. Sci.*, vol. 7 (2004), pp. 463–82.

[18] Shkliarevsky "Rethinking Democracy."

As has been explained earlier, there is a widespread conviction among many contemporary theorists that hierarchies and networks are ontologically separate and are opposed to each other. In their view, the entire evolution of human civilization provides many examples of this adversity that has nurtured numerous revolutions and uprisings throughout history.[19] As Niall Ferguson has observed in the quote cited earlier, "Clashes between hierarchies and networks are not new in history; on the contrary, there is a sense in which they are history."[20] So, while many theorists believe that the relationship between networks and hierarchies can be ameliorated, they also think that tensions between them will prevail and they will ultimately remain antagonistic to each other.

The relationship between hierarchies and networks has been the subject of the discourse on restructuring the public space for quite some time, at least since the 1970s. The balancing of hierarchical and non-hierarchical interactions represents the dominant trend in this discourse. This idea, for example, is present in neo-liberal political and economic program. Since Margaret Thatcher and Ronald Reagan launched and actively promoted the neo-liberal agenda, Western governments, and particularly the United States, as well as a host of major international organizations such as the World Trade Organization, the World Bank, and the Organization for Economic Cooperation and Development have standardized and naturalized the neo-liberal repertoire of economic discourses and managerial practices.[21]

Many critics have since disparaged the neo-liberal economic policies, social agenda, and environmental record. Many have also blamed it—as, for example, Kurlantzick has[22]—for the retreat of democracy and the decline of freedom around the world. While one can agree with much in the critique of neo-liberalism, it is worth pointing out that this approach is actually quite ambiguous. It is frequently associated with the concentration of power in the hands of political and economic elites; and, indeed, to a large extent, it is so. However, there is another dimension to neo-liberalism. In some very limited way, neo-liberalism reflects the awareness of the need to balance hierarchical and non-hierarchical interactions. It represents an attempt to combine the state, which is essentially a hierarchical structure, and the market—a domain of non-hierarchical relations.

Unfortunately, the neo-liberal agenda does not go nearly far enough in balancing hierarchical and non-hierarchical interactions. It limits its scope of balancing only to top economic and managerial elites and excludes large segments of population involved in the process of production and exchange, including but not limited to workers, employees and even small and medium-size businesses. In the United States, for example, small and medium size businesses do not qualify for a generous support of the kind that has been received by economic giants, such as GM, Ford, or major mega-banks. Also, while the market certainly has a non-hierarchical structure, our managerial culture remains by and

---

[19] On the origins of hierarchies, see B. Dubreuil B. 2010. Human Evolution and the Origins of Hierarchies: The State of Nature. (New York: Cambridge University Press, 2010).

[20] Niall Ferguson, "Networks and Hierarchies."

[21] Bronwyn Davies, Michael Gottsche, and Peter Bansel, "The Rise and Fall of the Neo-Liberal University," *European Journal of Education*, vol. 41, no. 2 (June 2006), pp. 305–19; Eric Sheppard and Helga Leitner, "Quo Vadis Neoliberalism? The Remaking of Global Capitalist Governance after the Washington Consensus," *Geoforum*, vol. 41, no. 2 (March 2010), pp. 185–94.

[22] Kurlantzick, *Democracy in Retreat*.

large hierarchical.[23] The top economic and managerial elites essentially adhere to principles of hierarchical control, rather than to the non-hierarchical mode associated with the market. For this reason, despite the intention of the framers of neo-liberalism, the merger of the state and "the market" has not resulted in the balancing of hierarchical and non-hierarchical interactions. Rather, it has strengthened the concentration of power and hierarchical principles in our society.

There are several comprehensive theoretical models for restructuring the domain of practice. They all recognize the futility of introducing a few individual changes, but rather advocate a total reorganization of our public space, including our political system, economy, managerial practices, education, social and cultural life and so on. The views on the subject of restructuring the public space are very diverse and represent a broad range of opinions from those that envisage a total elimination of hierarchies[24] to ones that see hierarchies as essential in our society and well worth preserving,[25] to everything in between. Most theorists adopt a pragmatic approach. Richard Mulgan is a typical representative of such pragmatism. In his view, hierarchies should retain some power but cooperate with networks when appropriate.[26]

It is interesting that most of the models for restructuring the public sphere emphasize the role non-hierarchical interactions. Of the several perspectives discussed in the article authored by Myra Ferree, William, Gamson, Jürgen Gerhards and Dieter Rucht, for example, only one—what the authors define as the representative liberal model—puts the emphasis on a hierarchical solution. The three other models that the article examines—the participatory liberal, the discursive and the constructivist model—have decidedly a non-hierarchical orientation.[27]

It is beyond the scope of this study to go into a discussion of these models in any great detail. The article by Ferree and her colleagues provides an excellent overview. However, one important observation is in order. Despite their very significant, sometimes even diametrical differences, these models have one common feature. They all regard hierarchical and non-hierarchical interactions as ontologically separate and even opposed to each other. Therefore, all their proposed solutions try to do is to ameliorate relations between the two types. Also, these solutions are decidedly one-sided. They do not actually balance these two types of interactions. Rather, they give preference to one type of interactions over the other, subordinating the latter to the former. Also, an impartial observer cannot help noticing that although the proponents of

---

[23] Harold J. Leavitt and Rhonda Kaufman, "Why Hierarchies Thrive," *Harvard Business Review* (2003) http://hbr.org/product/why-hierarchies-thrive/an/R0303G-PDF-ENG (accessed June 10, 2014); Steve Denning and Rod Collins, "Networks are smarter & faster than hierarchies: Q&A with Rod Collins," *Forbes* (March 31, 2011).

[24] Murray Bookchin, *The Ecology of Freedom: The Emergence and Dissolution of Hierarchy* (New York: Black Rose Books, 1991); Roderick Rhodes and Arthur William, "The New Governance: Governing without government1," *Political Studies*, vol. 44, no. 4 (1996), pp. 652–67; Steve Denning, "Why Hierarchies Must Sign Their Own Death Warrant To Survive!" *Forbes* (December 2, 2013), http://www.forbes.com/sites/stevedenning/2013/12/02/why-hierarchies-must-sign-their-own-death-warrant-to-survive/ (accessed December 20, 2013).

[25] April Joyner, "Why Hierarchies Are Good for Productivity," *Inc.* (September 2012).

[26] Richard Mulgan, "One Cheer for Hierarchy--Accountability in Disjointed Governance," *Political Science*, vol. 55, no. 2 (December 1, 2003), pp. 6–18.

[27] Myra Marx Ferree, William A. Gamson, Jürgen Gerhards, and Dieter Rucht, "Four Models of the Public Sphere in Modern Democracies," *Theory & Society*, vol. 31, no. 3 (June 2002), pp. 289-324.

these solutions try to justify their preferences, these justifications can hardly be described as objective. They hold these preferences on partisan grounds that remain largely unexamined.

A growing number of scholars recognize that a genuine combination of hierarchical and nonhierarchical interactions should be the basis for the reconstruction of the public space. One popular trend is the so-called hybrid solutions, that is, solutions that still see hierarchical and nonhierarchical interactions as ontologically separate but seek some format in which cooperation can become possible. These solutions are largely eclectic and do not achieve a true integration.[28] John Kotter, the chief innovation officer at Kotter International and a professor emeritus of the Harvard Business School, typifies this approach. In his view, hierarchies and networks are two separate structures that excel at what they do best. Kotter recognizes that hierarchies are very good at optimizing and are capable of effecting small and medium-sized changes but not large-scale transformations. He opines:

> But I am referring to something far bigger: large-scale organizational change, such as a company redesigning its entire business model, or accomplishing its most important strategic objectives of the decade, or changing its portfolio of product offerings. *And there is no evidence to suggest that the Hierarchy allows for such changes, let alone that it effectively facilitates them*.[29]

In Kotter's view, the future lies in the coexistence of the two structures in one business organization. In his own words:

> All of this has led me to believe that the successful organization of the future will have two organizational structures: a Hierarchy, and a more teaming, egalitarian, and adaptive Network. Both are designed and purposive. While the Hierarchy *is as important as it has always been for optimizing work, the Network is where big change happens*. It allows a company to more easily spot big opportunities and then change itself to grab them.[30]

Hybrid solutions provide a rich plethora of interesting ideas regarding possible mechanisms of interactions between hierarchies and networks. However, as all eclectic solutions, they do not have a solid theoretically grounding and tend to have internal contradictions. Nothing illustrates this shortcoming better than the discussion of such a critical subject as the relationship between leaders/managers and networks/employees. Opinions on this point vary widely, from a more activist role of leaders/ managers as

---

[28] Paul Fawcett, Rob Manwaring, and David Marsh, "Network Governance and the 2020 Summit," *Australian Journal of Political Science*, vol. 46, no. 4 (December 2011), pp. 651–67; John Kotter, "Hierarchy and Network: Two Structures, One Organization." *Forbes* (June 1, 2011), http://www.forbes.com/sites/johnkotter/2011/06/01/hierarchy-and-network-two-structures-one-organization/ (accessed May 20, 2014); Mark Ebers and Leon Oerlemans, "The Variety of Governance Structures Beyond Market and Hierarchy," *Journal of Management* (October 21, 2013), pp. 491-530; Mary Uhl-Bien, Russ Marion, and Bill McKelvey, "Complexity Leadership Theory: Shifting Leadership from the Industrial Age to the Knowledge Era," *The Leadership Quarterly*, Leadership and Complexity, vol. 18, no. 4 (August 2007), pp. 298–318.

[29] Kotter, "Hierarchy and Network" (emphasis added).

[30] Kotter, "Hierarchy and Network" (emphasis added).

enablers[31] to a weaker role as that of regulators and filterers of external information,[32] to an even weaker role as facilitators of critical discourse and enhancers of local interactions among network agents.[33] Some even believe that the desired goal can be achieved without structural changes by merely modifying the rationale for the role of hierarchies and by educating managers in the values and merits of organizational democracy. Martin Clarke and David Butcher, for example, see education and the principle of voluntarism they borrow from political philosophy as vehicles for reconciling hierarchies and networks in organizational structures.[34]

There is no doubt that the literature on hybrid solutions certainly deserves serious attention. It addresses many aspects of what is obviously a very complex and intractable problem. Many of its ideas are undoubtedly very useful. But even all together, they hardly measure up to the magnitude of the task, which leaves quite a few researchers dissatisfied and vying for a comprehensive solution. In their essay "Simplistic vs. Complex Organization: Markets, Hierarchies, and Networks in an Organizational Triangle," Wolfram Elsner, Gero Hocker and Henning Schwardt make an argument for just such a comprehensive solution. In their view, "… pure market and hierarchy, including their potential formal hybrids, are an empirically void set." Rather, real world "coordination forms," they argue, "have to be conceptualized in a fundamentally different way. A relevant organizational space must reflect the dimensions of a complex world."[35]

In making their appeal to complexity of the real world, Elsner, Hocker and Schwardt suggest that the division between hierarchical and non-hierarchical interactions is not real, it is merely conceptual;[36] that in reality, the two types of interactions are closely entangled with each other, although they fail to explain the nature of this entanglement. Numerous other researchers support the approach that centers on the entanglement of hierarchical and non-hierarchical interactions and the complexity of their relationship. Antoine Danchin points to the ubiquity of networks and hierarchies in nature and their complementary relationship.[37] Joan Roelofs challenges the simplistic view of networks as spontaneously resistant to hierarchies and naturally prone to democracy. As she maintains,

> …some participants in network governance are vastly more powerful than others. As for "civil society" organizations, support from corporate or private foundations is essential to almost all civil rights, social justice or environmental organizations that wish to be viable and visible; the funders

---

[31] Donde Ashmos Plowman, Stephanie Solansky, Tammy E. Beck, LaKami Baker, Mukta Kulkarni, and Deandra Villarreal Travis, "The Role of Leadership in Emergent, Self-Organization," *The Leadership Quarterly*, Leadership and Complexity, vol. 18, no. 4 (August 2007), pp. 341–56.
[32] Van Olffen and Romme, "The role of hierarchy."
[33] Joseph A. Raelin, "The End of Managerial Control?" *Group & Organization Management*, vol. 36, no. 2 (April 1, 2011), pp. 135–60; Joan Roelofs, "Networks and Democracy: It Ain't Necessarily So," *American Behavioral Scientist*, vol. 52, no. 7 (March 2009), pp. 990–1005.
[34] Martin Clarke and David Butcher, "Reconciling Hierarchy and Democracy: The Value of Management Learning," *Management Learning*, vol. 37, no. 3 (September 1, 2006), pp. 313–33.
[35] Wofram Elsner, Gero Hocker, and Henning Schwardt, "Simplistic vs. Complex Organization: Markets, Hierarchies, and Networks in an Organizational Triangle," SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, September 21, 2009), http://papers.ssrn.com/abstract=1476314.
http://www.nytimes.com/2016/05/12/opinion/campaign-stops/as-west-virginia-goes.html.
[36] Elsner et al., "Simplistic vs. Complex Organization."
[37] Danchin, "The Tree and the Ring."

exert control in many ways.[38]

Donna Chollett challenges the view of many horizontalists[39] who assert the intrinsic virtuousness of grassroots social movements and their natural inclination towards egalitarianism and democracy. She shows that networks develop their own hierarchies and forms of inequality.[40] Woody van Olffen and George Romme discuss the role of hierarchies in networks and point out their complementary relations.[41] Stanley Salthe stresses the spontaneous capacity of networks to generate hierarchies.[42] Alice Marwick reveals how media networks have forfeited their early promise of equality and have served as a breeding ground for new elites and dominant media personalities.[43]

In his insightful article on theoretical approaches to global economic regulation, Lawrence Tshuma makes an astute observation about the network properties of economic hierarchical bureaucracies that is worth quoting at length:

> The economic bureaucracies are effective because their autonomy is embedded in business networks that provide institutionalized channels for continual negotiation and renegotiation of economic goals and policies. The important point is that the relative autonomy of the economic bureaucracy from the sectors it regulates gives it scope to set and implement economic goals. The *economic bureaucracy and the individuals within it are, however, nodes within business networks*. The possession and exercise of sovereign power gives the economic bureaucracy power to co-ordinate and regulate activities requiring collective action, which are beneficial to capital as a whole but would not be within the profit interest of individual corporations. It can be argued, therefore, *that the networks linking economic bureaucracies and the business sectors they regulate provide a network mode of regulation*.[44]

Tshuma cautions against "applying bipolar concepts to the analysis of social relations," thus taking "a risk of imposing conceptual abstractions on dynamic and complex social relations and historical realities." He points to the experience in, among others, Asian developmental states that shows that "bureaucracies and networks are not mutually exclusive." Comparative research on the Asian development, he adds, "has identified the existence of a meritocratic and efficient economic bureaucracy along Weberian lines as critical to the unprecedented industrial transformation and economic development in Japan, Taiwan and Korea. Contrary to Weber's arguments, their

---

[38] Roelofs, "Networks and Democracy," p. 990.
[39] "Horizontalism" is the term used to designate those movements and ideologies that are in principle opposed to all hierarchies and seek to replace them completely or severely limit their power with a broad non-hierarchical approach to organization of public space, hence the name "horizontalists."
[40] Donna L. Chollett, "'Like an Ox Yoke': Challenging the Intrinsic Virtuousness of a Grassroots Social Movement," *Critique of Anthropology*, vol. 31, no. 4 (December 1, 2011), pp. 293–311.
[41] Olffen and Romme, "The role of hierarchy."
[42] Stanley Salthe, "The Spontaneous Origin of New Levels in a Scalar Hierarchy," *Entropy*, vol. 6, no. 3 (2004), pp. 327–43.
[43] Alice Marwick, "Elitism Not Revolution: Social Media's Broken Promise," *New Scientist*, vol. 222, no. 2968 (May 10, 2014), pp. 28–29.
[44] Tshuma, "Hierarchies and government," p. 131 (emphasis added).

effectiveness does not depend on their insulation from business."[45]

The suggestion made by Philip Agre summarizes well the spirit, if not in all details the letter, of the inputs by the aforementioned scholars. In his insightful essay on Herbert Simon's contribution to systems theory, Agre writes:

> My suggestion, then, is that phenomena of hierarchy and self-organization are not mutually exclusive, and that neither one is necessarily destined to win a world-historical battle against the other. Although they are analytically distinct and should not be conflated, they nonetheless coexist, in both ideology and in reality, and they are likely to continue coexisting in the future. From this perspective, *the models of Simon and the general systems theorists—all hierarchy or all self-organization—are models of simplicity, not of complexity. Real complexity begins with the shifting relations between the two sides*.[46]

While the above perspectives serve as a valuable source of insights, they ultimately do not resolve the problem of the relationship between networks and hierarchies. Despite their astute and nuanced observations on the nature of this relationship, they still see hierarchies and networks as ontologically separate. In their view, tensions between networks[47] and hierarchies can be ameliorated, but they will ultimately always remain a potential source of conflict.[48]

The perception that networks and hierarchies are polar opposites, perennially in tension and conflict with each other, contradicts what we know about systems in nature. As has been explained earlier, systems conserve themselves by forming bonds, or what Maturana and Varela called structural coupling,[49] with other systems in their environment in the process known as self-organization, and creating new organized totalities.[50] The process of creating a new organized totality gives rise to the operation that regulates the functioning of this totality. And that's what a system is: an organized totality with a common regulatory mechanism.

Since regulation is a product of combining the capabilities of the constituent parts of the new totality, its level of organization is more powerful than the level of organization of each of these parts or their sum total. The emergence of this more powerful level of organization creates a hierarchy. As one can see, regulation is a product of interactions among subsystems. It supervenes on local interactions and vitally depends on them for its own conservation.

The regulatory function required for conservation has to form strong bonds that would activate it, and first and foremost, it should have strong bonds with the subsystems

---

[45] Tshuma, "Hierarchies and government," p. 131.
[46] Philip E. Agre, "Hierarchy and History in Simon's 'Architecture of Complexity,'" http://polaris.gseis.ucla.edu/pagre/simon.html (accessed May 26, 2014), emphasis added.
[47] A network has been defined as "a set of interconnected nodes" (Castells, *The rise of the network society*, p. 470; Tshuma, "Hierarchies and Government").
[48] Shkliarevsky "Rethinking Democracy."
[49] Maturana and Varela, *The Tree of Knowledge*; Maturana, "Autopoiesis, structural coupling and cognition."
[50] Prigogine and Stengers, *Order Out of Chaos*; Kauffman, *Origins of Order*; Corning PA. 1995. "Synergy and self-organization"; Luhmann, *Social Systems*; Buck and Endenburg, "The Creative Forces of Self-Organization."

it regulates. This process of forming bonds between the global level of regulation and the level of local interactions results in the integration of the two levels of the system and the adaptation of local interactions to the global operations. Regulation can facilitate such adaptation since it has access to both local and global levels of organization. Such integration involves reflective coding, that is, a process that encodes global functions in terms of local interactions. The process of reflective coding results in the emergence of a framework that has sufficient power to incorporate both the local and the global level of organization as its particular cases. The emergence of this framework opens a new cycle of the evolution of the system.

As one can see from this brief description, regulation (hierarchy) and local (non-hierarchical) interactions do not stand in stark opposition to each other. On the contrary, they vitally depend on each other. Regulation supervenes on subsystems and at the same time helps to conserve them and enhance their degrees of freedom. This close symbiotic relationship is absolutely essential for conserving the entire system and ensuring its continued evolution. If the global and local functions are not integrated, if the bond that integrates them is weak, the regulatory operation cannot be conserved. If regulation lapses and subsystems cannot be properly regulated, the system begins to disintegrate. This disintegration does not stop at the level of subsystems. When bonds between subsystems grow weak, their own regulatory operations are not conserved. The process of disintegration will continue until all cascading nested levels of organization that have constituted the system disintegrate. Conservation of systems is incompatible with status quo. If a system does not evolve, it disintegrates.

This brief recapitulation is a reminder of how important the symbiotic relationship between local and global interactions is, how closely they are entangled, and, consequently, how dependent the two types of interactions are on each other. Moreover, as this study has pointed out earlier, the balance between equilibrium and disequilibrium plays an essential role in the evolution of the system. Equilibrium, or the balanced relationship among equal parts, is associated with non-hierarchical interactions, while disequilibrium is characteristic for hierarchical interactions. It has also been stressed earlier that the conservation and evolution of systems requires that equilibrium and disequilibrium should be in balance with each other. This requirement implies that hierarchical and non-hierarchical interactions, or hierarchies and networks in a system must also be in balance with each other.

There is nothing ontological about tensions between networks and hierarchies. On the contrary, in nature, hierarchical and non-hierarchical interactions are generally in balance and complement each other in advancing systemic evolution. As has been explained in Chapter Four, we can see this symbiotic relationship between hierarchical and non-hierarchical interactions only when we bring the process of creation into our focus. When we exclude the process of creation, we see hierarchical and non-hierarchical interactions as totally separate and opposed to each other.

One should also keep in mind that hierarchies are not fortuitous and arbitrary phenomena; they are not a result of some tragic aberration or accident in human evolution, as many opponents of hierarchies argue. They are a product of this evolution. Non-hierarchical interactions require regulation. Regulation represents a level of organization that is more powerful than that of the subsystems it regulates. And a more powerful level of organization means hierarchy. Since systems require a balance

between hierarchical and non-hierarchical interactions, the new social and political practice should also maintain such balance. Hierarchies and leaders have a vital role to play in the evolution of human systems, just as hierarchical and non-hierarchical interactions play a vital role in the evolution of systems in nature.

The preceding discussion has shown that regulation that functions at a more powerful level of organization in a system integrates the two levels of interactions—global and local—which conserves the system and makes its evolution possible. This observation about systems in general suggests that in social systems the role of leaders and hierarchies, which also operate on a more powerful level of organization, must be very similar. By virtue of their position, leaders can enormously facilitate the integration in systems because they have access and can observe both the global and local level of interactions. In order to integrate the system they regulate, leaders must resort to reflective coding—the procedure that Gödel used in his famous proof of consistency and completeness. It is a creative task because it creates a level of organization that can incorporate both global functions and local interactions as its particular cases.

The role leaders and hierarchies in this capacity has nothing to do with command and control, that is, transmitting decisions from those above to those below and overseeing their implementation. Leaders must appreciate the enormous creative power of local interactions and be closely attuned to their variations. Since they rely, or supervene, so much in what they do on interactions among network agents, or subsystems of the system, they should promote, regulate, and facilitate these interactions, not obstruct and disrupt them by trying to dominate them. It is a sensitive, delicate, and highly creative role that involves both cooperation and two-way adaptation. Those who operate at the global level and those involved in local interactions are both involved in a common creative enterprise of ensuring the preservation and evolution of the system that they constitute.

Because of their location in the liminal space between the system and its environment, hierarchies and leaders are in a position to reflect critically (that is, observing at the same time the system and also themselves as a part of the system)[51] on all interactions among the agents and subsystems of the system. The latter, by virtue of their position, can reflect only on local interactions. For this reason, the position of leaders allows them to perceive new and more powerful levels of organization created by all interactions within the system, as well as recognize, promote, and facilitate the consolidation of these new levels.

To summarize the preceding arguments, the creation of new levels of organization in systems—in other words, their evolution—is incompatible with the relationship of exclusion and domination. It requires cooperation and close interaction in the common creative work that sustains the evolution of the entire system. Such cooperation can only be effective if there is a balance between hierarchical and non-hierarchical interactions, between hierarchies and networks.[52] Leaders should not see their role as that of ultimate arbiters whose word is decisive and final—far from it. The notion of a leader as the ultimate arbiter without whom there will be chaos and instability is a result of a profoundly flawed view that is due to the exclusion of the process of creation from one's frame of vision and, as a consequence, a failure to understand how systems function and

[51] More on this in Shkliarevsky, "The Paradox of Observing."
[52] Shkliarevsky "Rethinking Democracy."

evolve. This view makes impossible to have clear and rational validity criteria that can help choose the most powerful level of organization. As has been argued elsewhere, the current approach largely relies on subjective choices of those at the top of the hierarchy.[53] The lack of such objective and rational criteria of validation is the main reason why we now tend to defer decisions to leaders. In the absence of such criteria, all decisions are subjective and all are equal. Recognizing all decisions as equal is likely to lead to chaos and instability and nobody wants to argue for disorder. As a result, the common current default is to defer to the decision of those who are at the highest level in the hierarchy because even a bad decision that preserves order is deemed better than chaos and instability. How many times have people ultimately paid the price for limitations of their leaders?

The New Democratic Practice of Sustainability

The focus on the process of creation provides a new approach toward sustainable development. As has been argued in Chapter Five, there are some serious shortcomings in the current approach to sustainable development. The main reason is the fact that this approach does not recognize and embrace the process of creation. It does not appreciate the close relationship between growth of entropy and the creation of new levels of organization. It views entropy production as the enemy and the principal culprit in the crisis of sustainability we experience today. The main cause of the sustainability problem is not the fact that we produce too much entropy. The main cause is the fact that we underutilize our most important resource—human creativity. As a result, we do not construct more efficiently new levels and forms of organization that would create new flows of energy and resources and that would stop depletion of sinks. Lacking this understanding, the current developmentalist perspective tends to treat symptoms rather than the real cause of the problem of sustainability.

Secondly, the currently dominant perspective also has a very narrow view of the problem of sustainability. It largely regards the complex problem of sustainability of our entire civilization, or what one could call "human system," as a function of few select areas, with other important subsystems playing essentially a subordinate role. Moreover, these selected areas are accepted basically in their current form with no significant modifications and changes deemed necessary. The narrowness of this approach may be one reason why sustainable development in its current formulation has not successfully dealt with criticisms and has failed to create a broad consensus in the sustainability debates that is essential for moving forward. In a word, the current approach to sustainable development is badly in need of a fundamental rethinking.

There are several important points that follow from the theoretical perspective outlined in this volume and that may prove to be beneficial for such rethinking. As has been argued earlier, sustainability of any system vitally depends on the creation of new levels and forms of organization. Therefore, sustaining the process that creates new levels and forms of organization should be the principal goal and the main product of our human system and all its subsystems without exception. Sustainability depends on our creativity in all spheres, rather than just in the select few and by the select few.

[53] Shkliarevsky "Rethinking Democracy."

The currently dominant approach to sustainable development views economy and technology as the primary areas where one should search for solutions of the sustainability problem. As has been mentioned earlier, systems, particularly as complex as human systems, have many dimensions and subsystems that are intricately entangled with each other. Systemic evolution is comprehensive and involves all the aspects and subsystems of a system. Due to entanglement, changes in any part of the system affect the entire system and all its parts.[54] Therefore, the approach to the problem of sustainability of the human system should also be comprehensive. All the subsystems of the human system, not just economy or technology as in the current approach, should be involved in the process of constructing new levels and forms of organization in their respective areas. It must involve fundamental changes in all spheres of our civilization: the political system, economy, management and decision-making, the system of education, healthcare, and others. And since, as has been argued earlier, the creation of new levels and forms of organizing reality and the enhancement of creativity require more openness, more inclusion, and more empowerment, the response should be broad democratization that will affect all aspects.

The human mind represents the most powerful level of organization of reality. As has been argued elsewhere, "organization of reality that involves symbolic thought has no limitations; it is in fact infinite."[55] This capacity makes our mind the most important resource. And yet, it is precisely this resource—that is, the creative capacity of the human mind—that remains systematically underutilized in our civilization.

Underutilization of resources results in lower productivity and efficiency. The underutilization and wastage of the creative capacities of the human mind deprive our economy of its most valuable resource. It hinders our ability to create new levels of organization that would allow us to capture new energy flows, identify new physical resources, and maintain the overall entropy production at the zero level. As a result, we have to rely on the existing energy flows, resources, and sinks, which leads to their depletion. A more efficient, systematic, and sustained construction of new levels and forms of organization will create conditions that will work against depletion of resources and energy available to us.

The wastage of human resources and the resulting inefficiency have other negative effects on our economy. Wastage of resources and inefficiencies of any kind make production wasteful and inefficient. Since our economy underutilizes human resources, the competition that drives its growth only increases its wastefulness and inefficiency. The more we pursue this kind of growth, the more inefficiency and wastage we produce.

Inefficiency and wastefulness increase the cost of production that drives up prices. High prices reduce consumption as they make products inaccessible to some potential consumers. The inability of a growing number of people to consume the product has detrimental effects on the economy as a whole, even under conditions of its relative growth. In an interview given to *The New York Times*, President Obama, for example, remarked: "If we don't do anything [about disparity of incomes], then growth will be slower than it should be. Unemployment will not go down as fast as it should. Income

[54] Kenneth Rogoff, for example, suggests an interesting connection between a lack of innovation and the financial crisis of 2008 (2013).
[55] Shkliarevsky, "Science and Its Discontents," pp. 47-48.

inequality will continue to rise."[56] First, the growing economic disparity and the decline of the middle class lead to the increasing concentration of wealth and the emergence of the underclass that has little buying power. A growing potential for social instability is the most obvious effect of such concentration of wealth and the resulting division in society into haves and have-nots. However, it is certainly not the only one. Concentration of wealth also creates serious distortions in economy. Because the product has to be consumed, the economy has to cater increasingly to the consumers who have high buying power, which leads to distortions in consumption patterns. The high-end clientele requires products that satisfy its increasingly saturated market. Consumption among the members of this group becomes conspicuous; they tend to buy products that symbolically represent their economic power and social prestige. A growing market for such conspicuous consumption can seriously distort economic production by encouraging trends that essentially do not generate more beneficial patterns of consumption—for example, consumption of knowledge.

Under the current conditions of the welfare state, an increase in poverty also puts additional strain on the economy and society. The Western model of the welfare state is committed to providing support for underprivileged groups. Growing poverty increases government expenditures. As the percentage of the poor increases, so do government expenses on their support. At the same time, overall economic inefficiency reduces government revenues. This combination of increased spending and declining government revenues creates budget deficits that put additional strain on the economy as they undermine the government's credibility that is essential for maintaining the health of our economic and financial institutions.

Catering to an increasingly exclusive group of consumers depresses economic growth. The declining growth forces producers to cut their expenses in order to stay competitive in the marketplace that is increasingly shrinking. As a result, they are forced to reduce their production expenses and concentrate their financial resources on essentials. The pressure is, first of all, to reduce expenditures on externalities—for example, environmental sinks—that are largely regarded as inessential for production. The result is the increased depletion of natural resources and the growth of entropy level in the environment that further reduces the flow of energy and resources from environment into the economy. Thus, environmental problems—in terms of both resources and sinks —are closely related to the underutilization of the human resources and the resulting inefficiencies in production. Indeed, these problems are symptoms of a serious defect in the way our human system is organized. Treating symptoms does not solve the problem. A policy that addresses merely the effects of inadequacies in our human system, as we currently do, can at best temporarily slow down the process of degradation, but it will not stop it. The solution of the problem of sustainability is not, as steady-state economics and de-growth advocates argue, in reducing consumption. On the contrary, it lies in increasing consumption.

Creating new and more powerful levels and forms of organization is essential to our life. Economic activity is an integral part of this process. It constitutes a special sphere that involves physical transformation of nature into forms useful for our creative practice.

---

[56] Jackie Calmes and Michael D. Shear, "Obama Says Income Gap Is Fraying U.S. Social Fabric," *The New York Times* (July 27, 2013).

There are two categories—consumption and production—that are fundamental to our economic thought; they are the pillars on which our entire body of economic theory and practice rests. In the current economic model these two categories are regarded as totally separate and diametrically opposed to each other.

The process of production consists in the production of values—a process that is associated with appreciation. The process of consumption consists in using these values. Such use generally lowers the value of the product; in other words, consumption depreciates the product. If we can think about our entire economy as a product, then, in accordance with our current economic thinking, we have to conclude that production and appreciation accelerate economic growth while consumption and depreciation slow it down.

Our economic thinking demands that our economy should be efficient; and efficiency requires minimizing losses and waste. When operating our economy, we try to achieve maximum efficiency possible, that is, we try minimize our losses and waste and maximize our benefits. Maximum efficiency presupposes that everything we produce must be consumed, that is, production and consumption should be in balance. Economic growth and the appreciation of the economy require an increase in consumption. As consumption rises, it slows economic growth and restores the balance. This model generally gravitates towards slow incremental growth where periods of increased economic activity are followed by periods of slowing down.

Current critics of the economic growth model argue that there is a natural limit to how much our economy can grow. This limit, they contend, is set by the carrying capacity of our planet and we must respect it. As an alternative to the model of infinite growth, they propose either steady-state economics or de-growth. Let's examine these alternatives.

The de-growth model proposes cutting consumption and cutting production. This approach produces immediate and very serious problems. First, there is a problem of political will. Few politicians will venture without risking their political career to propose such unpopular policies. Then there is also the question: How do you cut consumption without painful detrimental effects in terms of contraction of the economy, growing unemployment, and concomitant huge social unrest? How do you convince people to consume less? How do you enforce this policy, other than by imposing high prices? The prospects of de-growth are so devastating that the cure may very well be much worse than the disease. For these reasons, the scenario of de-growth is highly unlikely.

A balance between consumption and production is a crucial condition for a steady-state economy. Maintaining such balance requires a regulatory mechanism. The level of organization of such regulatory mechanism will be more powerful than the one at which our production and consumption operate. In other words, in order to maintain the balance between consumption and production we will have to create a new and more powerful level of organization of reality. Creation of such new and more powerful level means only one thing: our economy has advanced to a new level of organization; in other words, it has appreciated and, consequently, grown.

In order to conserve the entire economic system—production, consumption, and the mechanism of regulation—this system has to be integrated; that is, its two levels of organization—consumption and production representing one level and the mechanism of

regulation another—should be equilibrated. The equilibration of the two levels that have different power requires the construction of a framework that will possess the capacity to integrate both levels as its particular cases. The adaptation of production and consumption to the more powerful level of regulation will change them and increase their power. Since they change, they will have to be re-equilibrated with each other, which will inevitably lead to the rise of even more powerful regulatory level. Thus one can see that we cannot sustain a steady-state economy without its appreciation and consequently growth.

The above analysis of the two alternatives to the growth model shows that they are either inapplicable (de-growth) or contradictory (steady-state economics). The conclusion that follows from this analysis is that infinite economic growth is not only possible but is, in fact, essential. Without infinite economic growth our civilization simply cannot exist.

Our current economic thinking considers consumption to be separate from and opposed to production. While production appreciates our economy and causes it to grow, consumption depreciates it and slows down economic growth. As has been already stated earlier, maintaining the balance between consumption and production is the most essential condition for an efficient functioning of our economy. Since our economic model regards consumption and production as opposed to each other, maintaining their balance acts as a constraint on economic growth; this model can only envision the economic growth that is slow and steady.

Our economic model generally associates consumption with depreciation. However, is this exclusive association of consumption with depreciation justified? Does consumption always mean depreciation?

There are two kinds of consumption that we know. One kind of consumption is consumption of final products. Indeed, this kind of consumption always depreciates products. However, this is not the only form of consumption that we know. There is also a form of consumption that appreciates products, for example, consumption of raw materials or semi-finished products. Another interesting case of consumption is the consumption of technological devices and machines. Indeed, physical use of such devices and machines depreciates them. However, they also represent a certain technological knowledge. Knowledge consumption involves our mind. Mental consumption inevitably involves mediation and, therefore, construction that takes place in our mind. In other words, in order to consume something our mind has to construct it, or, in other words, produce it. Our sense organs transmit to our brain electrical signals that the brain interprets. We produce reality and production necessarily involves appreciation. Thus mental consumption involves necessarily the creation of new knowledge and hence appreciation.

The above argument bears one important conclusion that consumption does not necessarily involve depreciation. Consumption can also, like production, be associated with appreciation, particularly consumption that involves mental activity, that is, consumption of knowledge.

We live in the era of knowledge society when knowledge is the main means of production and the principal product. The share of knowledge production by comparison with the production of consumer goods is constantly growing and already outstrips the latter. Since consumption of knowledge, just like its production, is associated with

appreciation, the transition to knowledge society suggests that in the modern economy both consumption and production result in appreciation. They do not stand opposed to each other and their balance does not slow down the economy but is the source of its appreciation and constant growth. Since production is growing and so is consumption and both contribute to appreciation and economic growth, the pace of economic growth accelerates. The combined effect of growth that comes from production and consumption is double from what it has been. In other words, economic growth become exponential and it is infinite. I want to argue that this infinite and exponential economic growth is not only possible, but is, in fact, essential. Without such growth our civilization simply cannot exist.

The analysis of the process of creation indicates that there is a fundamental link between production and consumption. When we produce new levels and forms of organization, we assimilate, or consume, reality; and, conversely, we cannot consume reality without constructing its new levels of organization. Thus consumption and production are intimately interrelated. By disregarding the process of creation, our civilization does not appreciate this connection and tends to dissociate consumption from production. There is no true consumption without production and vice versa. This understanding of the important relationship between consumption and production is particularly relevant in the new knowledge economy, where production and consumption of knowledge is essentially the same process. Knowledge is one product that does not depreciate. On the contrary, knowledge is an infinite resource that only appreciates when it is used. For this reason, the privatization of knowledge cannot and should not work. Patterning knowledge production on the patterns of consumption and production we currently use will only impede the development of knowledge production.

As has already been stressed, the solution to the problem of sustainability lies in the most efficient utilization of human resources. This level of efficiency will require the use of the creative capacities of all people, not just select few. Many changes should take place in order for our society to maintain consistently such level of efficiency. First of all, achieving maximum efficiency in utilizing human creative capacity will require an open democratic political system on national and international levels. This system should allow broad segments of the population to have access to the process of formulating and making decisions. A profound democratization of our economy, again on the national and international levels, will be another important requirement. We will need to reform our modes of economic management in a way that would allow the processes of self-organization and creative interaction among producers at all levels, instead of our currently prevalent and hopelessly outdated hierarchical system of command and control.

Attaining efficiency in creating new levels and forms of organization will involve fundamental changes in the philosophy and practice of our system of education. Creation of knowledge and acquisition of skills and habits required for this process should be the main focus of our education. The reorganizations of economic and political systems should pursue also a profound transformation of our society that would seek to eliminate destabilizing social divisions. It should also enable and empower all people by providing access to social services that would enhance their creative capacities and help them become productive members of society. We should not judge our civilization by a few brilliant minds that appear from time to time; they may appear despite the existing system, not because of it. We should judge our civilization by the opportunities it

provides for an average person to unleash his or her creative potential and become a productive member of the community. Attaining the level of full utilization of human creative capacities is not a utopian goal. There is no final state of social organization that would correspond to this goal. Rather, this level of efficiency will require constant renewal and reinvention at all levels and all dimensions of our civilization; it will require constant transcendence of the existing levels of organization and the creation of new ones.

Our civilization is essentially a dissipative system that constantly generates entropy. As soon as this system ceases to create new levels and forms of organization, it begins to deplete available resources. The only way it can sustain itself indefinitely is by constantly redefining itself in ways that allow us to capture new energy flows and material resources; and where there are new energy flows and new material resources, work can be performed. It is our destiny to play this catch-up game, and the only way we can play it indefinitely is by constantly creating new levels and forms of organization so as to maintain the overall entropy level at zero. There is no way for our civilization to go back to less powerful levels of organization of social production. Limits to growth or de-growth are not ultimately realistic possibilities. Our civilization can only move forward. If we decide to terminate this progress, we will embark on the path that leads only to the eventual disintegration of our civilization and its disappearance—an option that even supporters of limits to growth or de-growth do not want to entertain.

There are no fundamental obstacles to infinite sustainability other than those that we have erected ourselves. Human mind is our most valuable and important resource in the quest for sustainability; indeed, it is the only resource that can help us attain this goal. In order to achieve infinite sustainability, we should strive for a maximal utilization of this resource. The minds of all members of our civilization, not just a select few, should be engaged in the creative enterprise of constructing new levels and forms of organization. The capacity to be creative is not limited to some exceptional individuals or groups. All human beings are in possession of this enormous creative power. We all accomplish one very important creative act in comparison with which all other human creations, no matter how important, pale: we all become conscious beings. The acquisition of consciousness is a creative act of enormous magnitude and significance. If we master the mechanism that we use in constructing our consciousness, if we establish control over the creative capacity that enables us to construct consciousness, we will harness an awesome power. This creative power has sustained our civilization in the past, and it will undoubtedly help us sustain our civilization into the indefinite future.

Democratization of Knowing

There is hardly an aspect of our civilization that we value more than knowledge. Much of what our civilization has achieved is a direct result of knowledge that humanity has acquired over the millennia of its existence. The importance of knowledge has grown immensely in this day and age when our civilization enters the stage in its evolution that we appropriately call "knowledge society." Yet despite this growing demand for knowledge, many critics claim that our scientific progress has significantly slowed down. What is particularly troubling is that such criticisms come from very prominent and highly respected figures in our scientific community. Steven Weinberg, a famous

physicist and Nobel laureate in physics, has symptomatically titled his article for *The New York Review of Books* "The Crisis of Big Science."[57] Many critics agree that although some incremental advances in our science are still possible, major paradigmatic breakthroughs are becoming increasingly unlikely.

Indeed, the pessimism about the current state of our scientific progress is not universally shared. There are many voices that point to continued remarkable achievements in our science and technology. However, no matter where one stands in this debate, few dispute the fact, which Thomas Kuhn has pointed out,[58] that there is a very high degree of inertia in our scientific community and, as a result, the progress of our science is not as dramatic as we desire or our society needs.

Why does our knowledge community have a high degree of inertia? Why is there this tendency toward stagnation? Why new ideas are marginalized and often dismissed? Many critics believe that there is some fundamental flaw in the way we practice our knowledge production. They point to the widespread belief that knowledge thrives in a democratic environment—the fact to which we often attribute the remarkable successes of Western science[59]—and argue that the inertia in our knowledge community is due to the deficit of democracy in the way we practice science. They blame this situation on politicization of knowledge production and the dominance of hierarchies. Hans Weiler, for example, argues in his piece provocatively entitled "Whose Knowledge Matters?"

> Specifically, the debate on knowledge and development reveals particularly well how profoundly the notion of knowledge and the practice of its creation and its use is affected by political forces. In this respect, the discourse on development is similar to the discourses on gender roles and on democracy which also, in their own way, testify to the political nature of knowledge.[60]

Daniel Araya, in his "Cultural Democracy: Universities in the Creative Economy" argues that the needs of the new creative economy require a better understanding of the linkages between democracy and innovation.[61] Bruno Latour draws attention to what he calls "hegemonic science" that jeopardizes our environment and democracy and argues for the rethinking of the principles and practices of our scientific enterprise.[62]

Criticisms suggest that our practice of knowledge production is exclusive. Complaints that new ideas are often marginalized and dismissed are not uncommon. In his piece entitled "Sociology of Modern Cosmology" cosmologist Martin Lopez-Corredoira, for example, argues that powerful hierarchies dominate our institutions for scientific research and development. Their control of resources, funding, appointment, and publications allows them to enforce conformity and orthodoxy. Those who advance

---

[57] Steven Weinberg, "The Crisis of Big Science," *The New York Review of Books*, May 10, 2012.
[58] Kuhn, *The Structure of Scientific Revolution*.
[59] Thomas A. Spragens Jr., *Reason and Democracy* (Durham and London: Duke University Press, 1990).
[60] Hans N. Weiler, "Whose Knowledge Matters? Development and the Politics of Knowledge," in *Entwicklung Als Beruf*, edited by Theodor Hanf, Hans N. Weiler, and Helga Dickow,. (Baden-Baden: Nomos, 2009), pp. 485–96; p. 485.
[61] Daniel Araya, "Cultural Democracy: Universities in the Creative Economy," *Policy Futures in Education*, vol. 8, no. 2 (2010), pp. 217–32; p. 217.
[62] Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy* (Cambridge, Mass: Harvard University Press, 2004).

new ideas find themselves, more often than not, unable to compete against powerful elites.[63] As a result, despite some successes, the current system of knowledge production tends to stifle creativity and obstruct innovation.[64] Indeed, in contrast to networks, vertical hierarchical control works on exclusion. So, the exclusionary practice of our knowledge production does not come as a surprise.

Why is this practice exclusive? The answer lies in our dominant view of knowledge and knowledge production. This view is based on an illusory assumption about knowledge. According to this assumption knowledge reflects reality. Nothing could be further from the truth. Our mental constructs are not some copies of reality; they are reality. They are the most powerful forms of organizing reality. As has been argued earlier, we can construct an infinite number of increasingly more powerful levels of organizing reality that can sustain an infinite number of new and more powerful forms. Our mind operates on the level of organization that is far more powerful than anything else in our Universe. Mental operations are real and, therefore, their products are real too. Due to the power of our mental constructs, we can always establish one-to-one correspondences between our mental constructs and whatever exists out there. It is precisely for this reason that the correspondence principle is not a sufficient criterion for validating knowledge.

Since, for obvious reasons, we cannot validate more powerful forms of organization with less powerful ones. Consequently, we cannot use external reality to validate our mental constructs. Yet, this is precisely what we do. This practice is deeply flawed. It creates an illusion. It merely projects our subjective constructs on reality and confers on them the mantle of objectivity. There is no rational basis to claim the status of objectivity for such projections. The only basis on which such claims rest today is the fact that they are adopted and approved by dominant hierarchies. New mental constructs, new ideas and theories pose a threat to these claims. In order to neutralize this threat, hierarchies use their dominant position to marginalize and dismiss new ideas. This practice hinders the process of creation and slows down the evolution of our knowledge. Our system of knowledge production rewards conformity.[65] In order to solve this problem, we must change our view of what knowledge is and, consequently change our approach to knowledge production.[66]

There is much truth to our belief that knowledge thrives in democratic environments. Therefore, in order to minimize and eliminate inertia in our knowledge production, we must democratize our knowledge production practices. Democracy and the process of creation have much in common. Both work, for example, on universal inclusion and empowerment. Therefore, in order to democratize our knowledge production, we must make the process of creation its central organizing principle.

Changing our practice in validating knowledge will be another important step in

---

[63] Martin Lopez-Corredoira, "Sociology of modern cosmology," arXiv e-print, December 2, 2008, http://arxiv.org/abs/0812.0537 (accessed 17 July 17, 2013).
[64] Brown, "Modern Science and Its Critics"; Charlton, "Why Are Modern Scientists so Dull?" Shkliarevsky, "Science and its discontents"; Weiler, "Whose knowledge matters?"
[65] Geoffrey Burbidge, "Explosive Cosmogony and the Quasi-Steady State Cosmology," November 4, 1997. http://search.arxiv.org:8081/paper.jsp?r=astro-ph/9711033&qid=1374070788750mix_nCnN_-392512110&qs=Burbidge (accessed March 7, 2012).
[66] Sally Brown, "Brainstorming: A Path to Sustainability," *BioCycle*, vol. 52, no. 8 (August 2011), pp. 60–63.

this direction. Our current system of validating knowledge is woefully outdated and inadequate. The principles of correspondence, empirical confirmation, and justification are at the heart of this system. As has been argued in Chapter Seven, the phenomenon of underdetermination shows that the establishment of correspondence, or fit, between theory and fact cannot be considered a reliable method of validation. Justification and empirical verification are highly dependent of subjective factors and cannot serve as reliable guarantors of objectivity. Observations and experiments do not lead to advances in knowledge. These advances are generated primarily by the creation of new and more powerful levels of organizing our mind. As Piaget has shown, our ability to perform mental operations develops as a result of our practical activities. It is obvious that since our mental operations are much more powerful that our physical manipulation of objects, they allow full reversal of this sequence: we can always translate our mental operations into practical ones, our theory into practice. Therefore, empirical verification is always possible and cannot serve as one of the most important criteria for validating knowledge.

Justification also cannot be used as one of the most important criteria for validating knowledge. Justification, or the establishment of the consistency of a theory, is essentially an equilibrating procedure. Equilibration, just as disequilibrium that it creates, is certainly an important part of the process of creation. As has been explained, the process of creation operates on the principle of balance between equilibrium and disequilibrium. Hence, we cannot accept equilibrium alone as a decisive criterion for validating knowledge. As Gödel has shown in his theorem of consistency and completeness, the establishment of logical consistency of a system requires that we disregard some true statements that exist in this system but cannot be proven on the basis of its axioms. By insisting on justification as a criterion for validation we must disregard those true statements that exist but whose consistency cannot be proven; we essentially must disregard new knowledge.

We can no longer afford a system of validation that depends on conformity and hierarchical control. A more efficient system requires the institutionalization of more open, inclusive, democratic, and, ultimately, more rational practices in validating knowledge and allocating resources. As has been stated earlier, the more inclusive a knowledge system is and the more extensive is its combinatorial capacity, the more powerful it is. Inclusiveness and power (in Gödel' s sense and not in the sense of domination), not conformity to dominant trends, should be the most important criteria in validating knowledge.

Critical awareness and introspection should be another important criterion. We often pay lip service to critical judgment and just as often forget that critical judgment concerns, first and foremost, our capacity to examine critically our own premises and self-evident truths. We should exercise a conscious and deliberate control over our own "truths" and unconscious biases rather than allow old and tired ideas hinder the creation of knowledge. Critical awareness is essential for the efficiency of knowledge production.[67]

This is not to argue that justification and empirical verification should have no role in validating knowledge. But we have to be aware of their limitations. We have to apply these criteria in ways that do not undermine such important criteria as inclusion and criticality.

[67] A fuller discussion of knowledge production is in 'Science and Its Discontents' (Shkliarevsky, 2013).

There is one objection frequently made against accepting the notion of the constructed nature of knowledge. Many, particularly in the realist camp, argue that such acceptance is tantamount to the recognition that all knowledge is subjective and relative. Thus, objectivity can no longer be applied as a criterion for validating knowledge. At first glance, this argument appears to be convincing. Indeed, if we do not use the fit between our knowledge and external reality, how can we claim that our knowledge is objective? On close examination, however, this argument proves to be untenable.

The word "objectivity" or "objective" usually conveys inclusiveness. When we characterize some representation as objective, we usually imply that it describes an object or a phenomenon from different points of view, that it includes many and preferably all available perspectives, and that such representation will not change, regardless of the point of view we may take. We call this condition point-of-view-invariance.

The sense in which we currently use the word "objectivity" does not satisfy this condition. What frequently passes today for objectivity is the projection on reality of what is essentially a particular dominant view and the exclusion or marginalization of other views. As has been explained, the condition of objectivity requires not only that we include all points of view but that we should also include ourselves in the act of observing, so as to account for our own subjectivity—that is, the assumptions, premises, and other self-evident truths we have used in constructing our representation of reality. In our current epistemological approach, this requirement creates a paradox—the paradox of observing. How can the observer observe himself/herself while observing the object? What will be the position from which one can perform such observations?

Objective and universal knowledge should incorporate the activity of knowing, that is, the process by which knowledge has been created. It should include the observer/knower into the field of observation. Observing the process of creation requires constructing a position from which this process can be observed. But how can one construct such position, since by constructing it, one becomes embedded in the process of construction? How is it possible to be inside and outside the process at the same time? Is this not a contradiction? Where can one locate a position that would allow such double observing? Is it possible to observe the observing without getting into an infinite reflective regression, as Luhmann has argued?[68] On also can put the question in this way: can one reflect on the process of construction/creation itself?

Our current and dominant epistemological approach offers no satisfactory and conclusive answers to these questions. It is aware of the problem of self-referentiality of knowledge and of the fact that observation is a function of the observer.[69] However, it provides no definitive solution to this problem. Luhmann, arguably the most insightful and nuanced theorist who has addressed this issue, fully understands, for example, that the circularity of observing is unavoidable and proposes to introduce what he calls "conditioning" to interrupt this circularity. Such conditioning, according to Luhmann, is a proper function of reason, or rather reasons, as he puts it. He is perfectly aware that rationality is not a panacea. In his words, rational conditioning merely transforms "the vicious circle into an infinite regress" since "one must ask for the reasons behind the reasons."[70] However, for Luhmann this infinite regress "is fitted with hopes of

[68] Luhmann, 1995, p. 479.
[69] Luhmann, 1995.
[70] Luhmann, 1995, p. 479.

approximating ever more closely to reality, which are finally anchored in functioning complexity."[71] In Luhmann's view, an awareness of circularity of reason is the key to a normative practice for observing reality:

> If one in turn justifies the reasons and keeps every step of this process open to critique and ready for revision, it becomes more improbably that such an edifice could have been constructed without reference to reality. The circularity is not eliminated. It is used, unfolded, de-tautologized. Without this fundamental self-reference all knowledge would collapse.[72]

Luhmann's answer to the paradox of observing is not, as Loet Leydesdorff charges,[73] in the absolutism of a super-observer. Rather, it is a cautious reminder that "questions of final justification can only be answered within the self-referential theories of self-referential systems" and in "the logic of universalistic theories that forces them [theories] to test on themselves everything they determine about their object."[74] The direction for resolving the paradox of observing pointed by Luhmann reveals modern sensitivity toward reflexivity, self-referentiality, recursivity and complexity. Yet it ultimately, too, is not a solution since Luhmann does not define the position from which one may be able to observe the object and the process of observing, and yet be simultaneously embedded, as it is, in this process.

The solution lies in understanding the process of construction/creation. It is logically correct to view the process of creation as a system. Since it is a system, this process also relies on regulation in order to sustain itself. Regulation is essentially a reflective operation. The view of the process of creation as infinite may suggest, as it does to Luhmann, that there is really no way to reflect on this process since for every reflective position there will always be a possibility of constructing another one. Every point of reflection can and will be succeeded by another one, no less embedded in the process of observing than its predecessor. Should one conclude, then, that the problem of the embedded observer cannot be resolved and all that is left is to rely on palliatives, such as Luhmann's conditioning?

Just like any other system, the process of construction requires stabilization and, therefore, regulation that offers a possibility of reflection. If the process of construction requires regulation, there must exist a position from which one should be able to reflect on the entire process while at the same time remaining deeply embedded in this process.

As has been repeatedly pointed out, conservation and regulation are at the heart of the process of creation. Conservation of functional operations requires regulation. In the initial stages of their development the regulatory mechanism is unstable. In order to acquire stability, it needs a regulatory mechanism of its own. As the new mechanism stabilizes itself, the process enters a new cycle. Thus the process of creation involves constant oscillation between equilibrium and disequilibrium, between equilibrating the current level and constructing a new (regulatory) level of organization, thus producing disequilibrium. Both equilibrium and disequilibrium are dynamically related in the

---

[71] Luhmann, 1995, p. 479.
[72] Luhmann, 1995, p. 479.
[73] Leydesdorff, 2000, p. 278
[74] Luhmann, 1995, p. 485.

evolution of the process of creation. The repetition of the cycle eventually leads to the improvement of the function of regulation and the process becomes increasingly more stable, despite constant changes. One can probably best describe this dynamic stability as homeorhesis, rather than homeostasis. Biologist Conrad Waddington has introduced this term to convey the capacity of maintaining the path of the evolution rather than a static condition. Homeorhesis implies the existence of a stable balance between equilibrium and disequilibrium. This dynamic balance has a function of regulation and, as a regulatory operation, offers a possibility of reflecting on the functioning of the process of construction/creation as a whole. It allows one to reflect on the process from the position of this dynamic balance; that is, in full awareness of both equilibration and the disequilibrium that it generates. Any mental construct (theory, idea, etc.) can and should be viewed with full awareness of the fact that it ultimately is a stage in the transition to new and more powerful levels of organization and that our task is to facilitate this transition, not make it difficult.

There is one more problem relevant to this discussion that the perspective centered on the process of creation helps to solve. As has been argued, our capacity to create new knowledge is infinite. Yet, we have to make decisions that have definite outcomes; and we have to base these decisions on specific descriptions of reality. How do we make such decisions if we know that the description we currently use may very well be incomplete, that there will most likely be another description that will support a very different decision? Also, is a complete description of reality—such as, for example, theory of everything pursued by some physicists—possible? Is a complete description of any object or phenomenon possible? We live in the world where infinity and finitude, our yearning for completeness and our recognition of infinite possibilities intertwine. These opposite tendencies pull us in different directions. How can we reconcile them? Can they be reconciled?

As the analysis of the process of creation in this volume shows, these two tendencies perfectly co-exist within the process of creation. This process represents infinite iterations of essentially a closed finite cycle. Yet this cycle is capable of constructing infinite levels and forms of organization of reality.

The perspective that focuses on the process of creation allows us to reconcile infinity and finitude. Many objects and phenomena we encounter in our universe are finite. As finite, they must have finite descriptions. Indeed, by constructing new and more powerful levels and forms of organization we can discern many new aspects in familiar objects and phenomena; many but not an infinite number, because they are ultimately finite. There will always be a point at which the infinite capacity of the process of creation to create new levels of organization will saturate the description of a particular object to the point where more powerful levels of organization will not be adding anything new to this description.

The process of creation forms the foundation of our infinite and infinitely changing universe. We certainly cannot predict what new levels and forms of organization of this universe will emerge in the future. But based on our understanding of the process of creation and the closed cycle of operations that it involves, we know that they will emerge and we know how they will emerge. Indeed, the description of the process of creation may be as close to a complete description of reality as we will ever get—one that covers not only the past and the present, but also the future.

CONCLUSION

There are two sets of interests that inform this book: theoretical and practical. One theoretical interest has to do with paradigms and paradigm shifts. Why do paradigm shifts occur and what is the mechanism that creates them? The focus of another theoretical interest is the process of creation. The two interests are closely interrelated.

As this book emphasizes, paradigms and paradigm shifts are not a result of our whims or accidental figments of our imagination. They are inevitable results of our actions that have creative outcomes. Regardless of our subjective intentions or motivations, there is only one goal these actions pursue. This goal is not external in relation to the action; it is located in the action itself. It has to do with conservation: by conserving their operations, systems that perform these operations conserve them and conserve themselves. The outcome of this conservation drive is the process that creates new organized totalities. Systems, including human systems, conserve themselves by evolving creating new levels and forms of organization that include them as particular cases. If a systems does not evolve it begins to disintegrate. Paradigms and paradigm shifts are not accidents; they are essential and creative outcomes of what is the most fundamental aspect of reality—the absolute imperative of change.

The interest in the process of creation is intimately related to the subject of paradigms and paradigm shifts. This process is ubiquitous throughout our universe. It originates in conservation that is the essential consequence of the most fundamental property of our universe—its uniqueness. The discussion of the process of creation has drawn heavily on the theoretical heritage of Jean Piaget, the theory of organizational knowledge creation, and constructivism. It has also relied on insight from such theoretical perspectives as systems theory, as well as studies of emergence, self-organization, complexity, and some others.

No doubt much is yet to be learned about the process of creation. This book, however, identifies some fundamental aspects of this process. Perhaps, the most important one is its inclusiveness. This process can only function on inclusion of difference. Difference is the source of creation; without difference, there is no creation. The process of creation also involves a number of important balances: the balance between equilibration and the production of disequilibrium, the balance between assimilation and adaptation, and the balance between hierarchical and non-hierarchical interactions. Maintaining these balances is absolutely essential for the efficient operation of the process of creation.

The set of pragmatic interests of the book have to do with the current state of our civilization, the problems it faces, and its future course. This book agrees with many contemporary commentators who describe the current state of our civilization as a systemic crisis and consequently recommend systemic solutions. It also agrees with their emphasis on the need for a fundamental shift in the way we organize our practices and institutions.

In accordance with its theoretical perspective, this book sees the current crisis and the resulting need for a paradigm shift in positive changes that have occurred in our civilization since the Second World War, most importantly technological innovations, economic changes, globalization, and others. The changes that have occurred and are

occurring signal that our civilization has reached a new stage in its evolution and that a new and more powerful level of organization is in the process of emerging. This new level of organization is not something that has been imposed on us; rather it is a result of our own creative efforts. The problems that we face are problems of growth, not decline.

While paradigm shifts are inevitable, as they are rooted in the very nature of our universe, the enormous costs that they involve in terms of destruction and human suffering are not. They are the consequences of our failure to embrace the process of creation. As this study has argued, the power differential makes the access of local interactions to the emerging global level very difficult; the former simply cannot see this new level of organization. As a result, adapting to the emerging global level becomes a long, arduous, incremental, and often painful process. But it does not have to be this way, not in human systems.

One conclusion that emerges from this study is that we can facilitate the process of adaptation. Through understanding the process of creation, we can avoid the high costs of transition; perhaps even save our civilization from destruction. In order to achieve this goal, we need to embrace the process of creation. The creation of new levels and forms of organization should become the main path to both social progress and personal fulfillment for all of us—those at the top of hierarchies and those involved in local interactions. Our understanding of the process of creation and its mechanism will help us establish conscious control over it and facilitate the adaptation to the emerging levels of organization. This study has emphasized the role that new forms of leadership can play in this respect by making the global level of organization accessible from the level of local interactions.

The problems of this transition period are a result of our failure to embrace the process of creation. The reason for this failure is the persistence of the Enlightenment tradition that continues to dominate our civilization. The legacy of this tradition defies simplistic generalizations. Indeed, as this study has argued, the Enlightenment tradition has not grasped the close interrelationship between equilibration and the production of disequilibrium that is essential to the process of creation. As a result, the process of creation has remained largely peripheral to our social practices and institutions.

One of the consequences of the failure to embrace fully the process of creation has been and still is a persistent tendency towards exclusion that has plagued the Enlightenment tradition ever since its inception; and exclusion opens the path to domination and violence. Inclusion, particularly the inclusion of differences, requires creating more powerful levels of organization that would include differences as their specific cases. In other words, it requires a creative act. By failing to embrace the process of creation, the paradigm that dominates our civilization makes inclusion very difficult, if not impossible.

Post-structuralism—the nemesis of the Enlightenment tradition—does not transcend the Enlightenment tradition. On the contrary, despite its systematic criticism of this tradition, post-structuralism remains wholly within it. Although post-structuralism consistently champions difference, it fails to offer an alternative to the dominant paradigm. On a theoretical level, it advocates a rejection of all meta-narratives that it sees as legitimating exclusion and domination. Yet, on a trivial side, the imperative of rejecting all meta-narratives is ironically . . . a meta-narrative in its own right. On a more serious note, as this study has argued, no cognitive system can exist without a global

level of organization that regulates interactions among its sub-systems. Such global levels sustain the integrity of systems and their evolution. Systems cannot survive by maintaining status quo. They must evolve or they begin to disintegrate.

On the level of social practice, post-structuralism can offer little more than agonistic competition for domination, as Laclau and Muffet reveal, not a prospect for emancipation. Despite its advocacy in support of difference, post-structuralism does not offer a perspective that would conserve difference. As this study argues, the only way to conserve difference is to construct a new and more powerful level of organization that would include differences as particular cases. In other word, conserving difference requires an act of creation. Just as the target of its critique—the Enlightenment tradition—post-structuralism also fails to embrace the process of creation and, for this reason, cannot resolve the problem of exclusion and domination. Just like the Enlightenment tradition, post-structuralism also cannot complete the project of emancipation.

Transcending the Enlightenment tradition does not mean abandoning it. In critiquing this tradition, one should also recognize its complexity. While this tradition has failed to embrace fully the process of creation, it has also sustained our interest in this process and has inspired persistent efforts to understand its mechanism of creation. By embracing the process of creation and making it the new organizing principle of our civilization, we do not reject the Enlightenment tradition. On the contrary, by transcending this tradition, we accomplish a creative act conserves it as a particular case of a more general framework.

This study has advocated the embracing of the process of creation as a way to transcend the Enlightenment tradition. Few people have doubts as to the benefits that creativity can bring to human civilization. The process of creation has played a uniquely important role in the past evolution of our civilization and has brought it to its current unprecedented level of development; it can secure our future. As this study argues, the time has come to adopt the process of creation as the main organizing principle of our social practices and institutions.

All systems are based on fundamental propositions. The cognitive system that the new paradigm represents is no exception. Its fundamental proposition concerns the process of creation. Indeed, in this regard, the proposed paradigm is not different from those that have preceded it. But there are important differences. All previous paradigms, including those that are part of the Enlightenment tradition, have not grasped the close and complementary relationship between equilibration and the production of disequilibrium. As a result, they have failed to appreciate and embrace fully the process of creation that is so fundamental to our Universe, its evolution, and the evolution of everything in it. The perspective that focuses on the process of creation embraces the most essential and the most enduring aspect of reality—its changeability.

The failure of the Enlightenment tradition to embrace the most essential part of reality has led to representations of reality that are woefully incomplete. The result has been a view of reality that was fragmented and flawed. Interpretations of reality that this view has been able to produce have also been fragmented and flawed; and such interpretations could only lead to actions that had to be inadequate in one way or another. As this study has shown, one can trace several major problems that plague our

civilization to the failure of the paradigm that dominates our civilization to embrace the process of creation.

The world in which we live is dynamic; it is constantly changing and will continue to change into the indefinite future. Yet the process that creates these changes will remain unchanged in its basic features. Although this process can be abstracted from many phenomena, it is not an abstraction. Recognizing this process does not require one to step out of the flow of existence and to take a position of an absolute and privileged observer outside the frame of the proposed paradigm. On the contrary, each of us has an immediate existential experience that involves creation. Without this process, we would not be able to see, think, or write anything. Without the process of creation, this book would never see the light of day. The process of creation is not merely a mental construct; it is also our authentic existential experience—it is the main condition for having existential experiences.

The proposed paradigm is not just another meta-narrative as some may see it. There is nothing in this paradigm that may in any way limit future changes. On the contrary, it embraces the very process that creates new levels and forms of organization. According to the new paradigm, the inclusion of differences is the principal vehicle for change. By insisting on universal inclusion and empowerment, this paradigm in a very real sense makes the production of changes the essential feature of its approach to social practice.

This volume has devoted much attention to understanding the various and diverse aspects of the process of creation. Such understanding will be particularly helpful in guiding the realization of the new paradigm. One very important aspect of the process of creation is its connection to knowledge production. New and more powerful levels of organization give rise to new ideas, theories, approaches, and methods that enrich our capacity to understand the world in which we live. They allow us to identify new aspects of reality, establish new and more diverse one-to-one correspondences between our mental constructs and reality, and invent new ways of relating to and using reality. In other words, the process of creation has an important cognitive dimension: it produces knowledge. In a very real sense, the process of creation—not just equilibration as in the current approach to knowledge production, but also including the production of disequilibrium—is the source of our knowledge.

The requirement of the inclusion of difference relates to another important aspect of the process of creation. In order to include differences, we must acknowledge them. The acknowledgement of differences requires a broad recognition of autonomy, both one's own and that of the other. The recognition of and respect for autonomy constitutes the foundation of morality and moral values. Thus the process of creation has an important moral dimension that is integral to it.

The inclusion of differences also involves their validation. Each included difference enriches the whole. By validating differences we recognize that every individual who bears a difference is capable of sustaining and enriching the common process of creation. In other words, the process of creation involves the affirmation of the individual and his or her agency.

The act of affirming one's agency creates a sense of pleasure and is the source of gratification. Gratification represents the basis for aesthetic experiences and, thus, is the source of aesthetic values and sensibilities. Therefore, there is another important

dimension integral to the process of creation—an aesthetic dimension. The involvement in the process of creation affirms one's agency. It empowers the individual and is the source of gratification. The process of creation constitutes the basis for our aesthetic experience and gives rise to our aesthetic values and sensibilities.

Thus, there are four very important dimensions to the process of creation: social, cognitive, moral, and aesthetic. Although they are different and autonomous from each other, they are all integral to the process of creation. Their close interrelationship is essential for creation.

The Enlightenment tradition has created its own set of values, attitudes, and modes of behavior that have sustained it. The new paradigm will also transform our values, the way we view and relate to our own self and to that of others. The realization of our profound connection to the process of creation will result in a new and dynamic sense of self—one that is constantly in the process of becoming and reinvention. With this new sense of self our reaction in encountering differences will not be likely to become defensive and protect our self, as it all too often happens in our current interactions with each other; rather, our first impulse will be to reinvent the way we view and approach reality by creating a new level of our mental organization that will include all differences, including our own, as its particular cases; in other words, by creating a new self.

The quest for truth has played and continues to play a very important role in the evolution of our civilization. For millennia it has animated our imagination; it has been a source of profound insights and inspired important intellectual breakthroughs. Its grip on our minds does not weakened as time passes. It continues to excite us. If anything, its attraction has become even stronger.

Yet despite its great benefits, the quest for truth appears to be a self-defeating enterprise: it seems to aspire for the impossible. Even if we succeed in our aspiration to uncover the final truth, we would have to reject it. Truth implies certain finality—an end of our search. What seems to be awaiting us at the end of this journey is a paradox—the paradox of our existence that combines infinity and finitude. On one hand, our quest for knowledge guides us to attain the final truth; and on the other, the very process of searching for truth has become so much part of our existence that we cannot imagine our life without it. One can think of our civilization as at attempt to come to grips with these two contradictory aspirations and resolve this paradox. The fact that the resolution of this paradox seems impossible does not stop us. Anything that appears to be impossible attracts our imagination; the difficulty of such tasks only strengthens our determination to pursue them. Such is our paradoxical nature.

In some way, this book is also about our contradictory aspiration to embrace both finitude and infinity. It tries to outline a tangible organization for our practices that would allow infinite growth; it seeks to bring together disparate elements that seem to be incompatible with each other and yet prove to be able to coexist without disrupting our world.

As this book emphasizes, human consciousness is the most powerful form of organization of reality. It is capable of infinite reflection and can construct countless new and increasingly more powerful levels and forms of our mental organization. Our consciousness has emerged in the course of the evolution that is propelled by the process of creation; through the evolution we have inherited the awesome powers of this process.

In many ways our consciousness is a perfect embodiment of the process of creation. By consciously embracing the process of creation, by understanding how it operates, and by using this knowledge, we will be able to control and use this powerful tool and immensely enhance our capacity to create. This tool will enable us to generate an infinite number of increasingly more powerful levels and forms of organizing reality. The more powerful are the combinations that our mind is capable of constructing the more complex problems we will be able to identify, and the more robust solutions for these problems we will be able to produce. Embracing this process and using it to organize our social practice will effectively solve the paradox of infinity and finitude. This knowledge, although finite, will enhance, not restrict, an infinite evolution of our civilization. It allows us to embrace all creations—past, present, and future. We may not know today what humans will be able to create in the future, but we will know how they will create it.

The paradigm shift that this book outlines will involve concomitant changes in the way we produce knowledge, our ethical values, aesthetic sensibilities, and our social relations. We will have to reassess our practices in all these areas from the point of view that we can call objective in every sense of this word. Objectivity requires including the observer into the process of observing. The perspective that centers on the process of creation allows us to observe simultaneously the product of our creation and the process we use in creating it. Located at the intersection of equilibrium and disequilibrium, in the domain of regulation, this view is capable of including in its frame of vision the entire process while focusing on specific constructs. It allows us to create a specific form, while also enhancing possibilities for creating future and yet unknown forms. It allows us to embrace the finite form and at the same time enhance the infinity of our striving.

The course of our evolution is not predetermined. There is no supreme consciousness that has conceived this evolution at the beginning of times (if there ever was such beginning), even in its general contours, to say nothing about its details. As poetic as this vision may appear to some, it ultimately impoverishes us by offering a logocentric projection of ourselves on the grand edifice of our Universe, shaping it according to our own image and likeness. Our consciousness is the most powerful form of organization of reality but it is not the only one. As the most powerful form it conserves and incorporates all the forms that have preceded it, but it cannot replace them, no more than the non-Euclidian geometry can replace the Euclidean one, no more than our own biological survival can replace the existence of all organisms that preceded us.

We can admire wonderful creations of our mind and imagination, but reality is always more fascinating. The great Spanish poet Federico Garcia Lorca, who was no stranger to poetic imagination, has included the following inspiring passage that speaks to this point into his essay "The Irresistible Beauty of All Things":

> Imagination is poor, and the poetic imagination more so.
>
> Visible reality, the facts of the world and of the human body, are much more full of subtle nuances, and are much more poetic than what imagination discovers. One notices this often in the struggle between scientific reality and imaginative myth, in which—thank God—science wins. For science is a thousand times more lyrical than any theogony.
>
> The human imagination invented giants in order to attribute to them the construction of great grottoes or enchanted cities. Later, reality taught us that those great caves are made by the drop of water. The pure,

> patient, eternal drop of water. In this case, as in many others, reality wins. After all, it is much more beautiful that a cave be a mysterious caprice of water—chained and ordered by eternal laws—than the whim of giants who have no other meaning than that of an explanation.[1]

We can be in awe of the idea that some supreme consciousness has imagined all that can be imagined, but it is far more fascinating to understand the process that has led from the formation of particles to the emergence of nuclei and atoms, to the rise of biological organisms and human consciousness, and on to the creation of our ethical values, norms, aesthetic sensibilities and enjoyment. Such understanding will teach us to embrace our own autonomy and the autonomy of reality external to us. It will teach us about our profound connections to this reality and our ultimate mission in this universe. If this book succeeds, even to a small degree, to convey this message, it will achieve its goal.

[1] Federico Garcia Lorca, "The Irresistible Beauty of all Things," http://laingsociety.org/colloquia/artliterature/irrestiblebeauty.htm (accessed May 25, 2016).

BIBLIOGRAPHY

"Nuclear Theory Nudged," *Nature*, vol. 466, no. 7310 (August 26, 2010), p. 1034.

"Our Common Future. From one earth to one world"—A/42/427 annex, overview—UN documents: gathering a body of global agreements, at http://www.un-documents.net/

"Science Cannot Fully Describe Reality, Says Templeton Prize Winner." *Science,* March 16 2009.
0102.pdf (accessed July 20, 2008).

Addiscott, T. M. "Entropy and Sustainability." *European Journal of Soil Science*, vol. 46, no. 2 (1995), pp. 161–68.

Adorno, Theodor W., and Max Horkheimer. "Odysseus or Myth and Enlightenment." *New German Critique*, no. 56 (Spring 1992), pp. 109-141.

Agre, Philip E. "Hierarchy and history in Simon's 'Architecture of Complexity.'" *Journal of the Learning Sciences*, vol. 12, no. 3 (2003), pp. 413–26.

Agre, Philip E. "Hierarchy and History in Simon's 'Architecture of Complexity.'" http://polaris.gseis.ucla.edu/pagre/simon.html (accessed May 26, 2014).

Ahmed, Nafeez Mosaddeq. *User's Guide to the Crisis of Civilisation: And How to Save It*. London: Pluto Press, 2010.

Ahmed, Nafeez. "New age of global unrest in full swing as industrial civilization transitions to post-carbon reality," *The Guardian* (March 1, 2014). http://www.rawstory.com/rs/2014/03/01/new-age-of-global-unrest-in-fullswing-as-industrial-civilization-transitions-to-postcarbon-reality/ (accessed March 3, 2014).

Ahmed, Nafeez. "New Age of Global Unrest in Full Swing as Industrial Civilization Transitions to Post-Carbon Reality | The Raw Story." *The Guardian*, March 1, 2014, http://www.rawstory.com/rs/2014/03/01/new-age-of-global-unrest-in-full-swing-as-industrial-civilization-transitions-to-post-carbon-reality/ (accessed March 12, 2014).

Ahmed, Nafeez. "Review: The Great Transition—The New Paradigm." *Resilience* (December 24, 2014), http://www.resilience.org/stories/2014-12-24/review-the-great-transition-the-new-paradigm (accessed March 30, 2016).

Allen, Amy. "Feminist Perspectives on Power." *The Stanford Encyclopedia of Philosophy*. Edward N. Zalta. Ed. Summer 2014, http://plato.stanford.edu/archives/sum2014/entries/feminist-power/ (accessed May 14, 2015).

Allen, Amy. "Reason, Power and History Re-Reading the Dialectic of Enlightenment." *Thesis Eleven*, vol. 120, no. 1 (February 1, 2014), pp. 10–25.

Allen, Amy. "Rethinking Power." *Hypatia*, vol. 13, no. 1 (January 1, 1998), pp 21–40.

Allen, Amy. "The Unforced Force of a Better Argument, http://ptw.uchicago.edu/Allen09.pdf (accessed May 14, 2015), p. 4.

Allen, Amy. "The Unforced Force of the Better Argument: Reason and Power in Habermas' Political Theory." *Constellations*, vol. 19, no. 3 (September 1, 2012), pp. 353–68.

Almog, J. *What am I? Descartes and the Mind-Body Problem*. Oxford: Oxford University Press, 2001.

Annila, Arto, Stanley Salthe, and B. Weber. "Physical Foundations of Evolutionary Theory." *Journal of Non-Equilibrium Thermodynamics*, vol. 35, no. 3 (October 2010), pp. 301–21.

Appadurai, Arjun. "Dead Certainty: Ethnic Violence in the Era of Globalization." *Development and Change*, vol. 29, no. 4 (October 1, 1998), pp. 905-925.

Approach." *Columbia Law Review*, vol. 101 (April 2001), pp. 458-569.

Araya, Daniel. "Cultural Democracy: Universities in the Creative Economy." *Policy Futures in Education*, vol. 8, no. 2 (2010), pp. 217–32.

Arendt, Hannah. *On Violence*. New York: Harcourt, Brace & World, 1970.

Ateljevic, Irina. "Transmodernity: Integrating Perspectives on Societal Evolution." *Futures*, vol. 47 (2013), pp. 38–48.

Attali, Jacques. "The Crash of Western Civilization: The Limits of The Market and Democracy." *Foreign Policy*, issue 107 (Summer 1997), pp. 54-64.

Axel Honneth, Axel, and Miriam Bankovsky. "The relevance of contemporary French philosophy for a theory of recognition: An interview." In Miriam Bankovsky and Alice Le Goff. Eds. *Recognition Theory and Contemporary French Moral and Political Philosophy.* Manchester: Manchester University Press, 2012. Pp. 23–38.

Azmanova, Albena. *The Scandal of Reason: A Critical Theory of Political Judgment*. New York: Columbia University Press, 2012.

Bailly, Francis, and Giuseppe Longo. "Randomness and Determination in the Interplay Between the Continuum and the Discrete." *Mathematical Structures in Computer Science*, vol. 17, issue 2 (April 2007), pp. 289-305.

Bandow, Doug. "From Iraq to Ukraine, from Syria to Yugoslavia: terrorists who wrecked the modern world a century ago are creating more wars today." *Forbes* (June 30, 2014.

Bankovsky, Miriam. "The Future of Critical Theory: Between Reason and Power. Reply to Amy Allen." *Thesis Eleven*, vol. 120, no. 1 (February 1, 2014), pp. 26–42.

Banuri, Tariq. "Sustainable Development Is the New Economic Paradigm. *Development*, vol. 56, no. 2 (June 2013), pp. 208–17.

Bataille, Georges. *The Accursed Share: An Essay on General Economy*. New York : London: Zone; Distributed by MIT, 1991.

Bauman, Zygmunt. *Modernity and the Holocaust*. Ithaca, N.Y: Cornell University Press, 1989.

Beck, Ulrich. "Reframing Power in the Globalized World." *Organization Studies*, vol. 29, no. 5 (May 1, 2008), pp. 793–804.

Beiser, Frederick C. *Hegel*. New York: Routledge, 2005.

Bell, David F., and Lawrence R. Schehr. "Reading Violence." *SubStance,* no. 86 (1998).

Bellon, Christina M. "The Politics of Ourselves: Power, Autonomy, and Gender in Contemporary Critical Theory. By Amy Allen." *Metaphilosophy*, vol. 42, no. 3 (April 2011), pp. 340–45.

Belousek, Darrin. "Underdetermination, Realism, and Theory Appraisal: An Epistemological Reflection on Quantum Mechanics." *Foundations of Physics*, vol. 35, no. 4 (April 2005), pp. 669-695.

Ben-Ari, Mordechai. "The End of Science Revisited." *Skeptic*, vol. 13, no. 2 (June 2007), pp. 20–27.

Ben-Naim, Arieh. *Entropy Demystified: The Second Law Reduced to Plain Common Sense*. New Jersey: World Scientific Publishing Company, 2008.

Benski, Tova, Lauren Langman, Ignacia Perugorría, and Benjamín Tejerina. "From the Streets and Squares to Social Movement Studies: What Have We Learned?" *Current Sociology*, vol. 61, no. 4 (July 1, 2013), pp. 541–61.

Bergson, Henri. *Creative Evolution*. London, New York: Palgrave Macmillan, 2005.

Bergström, Lars. "Underdetermination and Realism." *Erkenntnis*, vol. 21, no. 3 (November 1, 1984), pp. 349–65.

Bhaskar, Vinit, and Andrew Glyn. Eds. *The North, the South and the Environment*. London: Earthscan Publications and United Nations University Press, 1995.

Bialasiewicz, Luiza. "'The Death of the West': Samuel Huntington, Oriana Fallaci and a New 'Moral' Geopolitics of Births and Bodies." *Geopolitics*, vol. 11, no. 4 (Winter 2006), pp. 701–24.

Bich, Leonardo, and Luisa Damiano. "On the Emergence of Biology from Chemistry: A Discontinuist Perspective from the Point of View of Stability and Regulation." Penultimate manuscript (2012). URL: http://www.academia.edu/2047983/On_the_emergence_of_biology_from_chemistry_a_discontinuist_perspective_from_the_point_of_view_of_stability_and_regulation (accessed November 5, 2012).

Birmingham, Peg. "On Violence, Politics, and the Law." *The Journal of Speculative Philosophy*, vol. 24, no. 1 (2010), pp. 1-20.

Blau, Adrian. "Rationality and Deliberative Democracy: A Constructive Critique of John Dryzek's Democratic Theory." *Contemporary Political Theory*, vol. 10, issue 1 (2011), pp. 37-57.

Blockmans, Wim, and Peter Hoppenbrouwers. *Introduction to Medieval Europe 300–1500*. London: Routledge, 2014.

Boden, Margaret A. *Mind as Machine*. Oxford: Clarendon Press, 2006.

Boden, Margaret. *The creative mind: Myths and mechanisms*. London: Routledge, 2004.

Bogdan, Ciprian. "Intersubjectivity and Techno-Science: Jürgen Habermas." *Journal for Communication and Culture*, vol. 3, no. 1 (Spring 2013), pp. 29–47.

Bookchin, Murray. *The Ecology of Freedom: The Emergence and Dissolution of Hierarchy*. New York: Black Rose Books, 1991.

Bowler, Peter J. and Iwan Rhys Morus. *Making Modern Science: A Historical Survey*. Chicago: University of Chicago Press, 2005.

Bowles, Samuel. "The emergence of inequality and hierarchy: a network explanation." San Francisco, 2009, presentation at the January 2009 meetings of the American Economic Association, tuvalu.santafe.edu/~bowles/NetworkExplanation.pdf (accessed May 14, 2014).

Bowman, Jonathan. "The European Union Democratic Deficit Federalists, Skeptics, and Revisionists." *European Journal of Political Theory*, vol. 5, no. 2 (April 1, 2006), pp. 191–212.

Bricmont, Jean. "Determinism, Chaos, and Quantum Mechanics." http://www.scribd.com/doc/11328575/Jean-Bricmont-Determinism-Chaos-and-Quantum-Mechanics (accessed September 12, 2009).

Brown, Sally. "Brainstorming: A Path to Sustainability," *BioCycle*, vol. 52, no. 8 (August 2011), pp. 60–63.

Buchanan, Mark. "Quantum Randomness May Not Be Random." *New Scientist*, March 18, 2008.

Buck, John A., and Gerard Endenburg. *The Creative Forces of Self-Organization*. Sociocratic Center: Rotterdam, Netherlands, 2010.

Burawoy, Michael. "The Roots of Domination: Beyond Bourdieu and Gramsci." *Sociology*, vol. 46, no. 2 (April 1, 2012), pp. 187–206.

Burbidge, Geoffrey. "Explosive Cosmogony and the Quasi-Steady State Cosmology," November 4, 1997. http://search.arxiv.org:8081/paper.jsp?r=astro-ph/9711033&qid=1374070788750mix_nCnN_-392512110&qs=Burbidge (accessed March 7, 2012).

Burnett, Kimberly, Lee Endress, Majah-Leah Rovago, James Roumasset, and Christopher Wada. *Islands of Sustainability in Time and Space*. University of Hawaii's Department of Economics Working Paper Series, Working Paper No. 11-12 (Honolulu: University of Hawaii, 2011).

Calmes, Jackie, and Michael D. Shear. "Obama Says Income Gap Is Fraying U.S. Social Fabric." *The New York Times* (July 27, 2013).

Carr, Paul H. "Does god play dice? Insights from the fractal geometry of nature. *Zygon*, vol. 39, no. 4 (2004), pp. 933–940.

Carroll, Sean. "Is Our Universe Natural?" arXiv:hep-th0512148v1 13 Dec 2005 (accessed February 21, 2010).

Casanova, José. "Cosmopolitanism, the clash of civilizations and multiple modernities." *Current Sociology*, vol. 59, no. 2 (2011), pp. 252-267.

Castells, Manuel. *The Rise of the Network Society: Information Age*. Vol. 1. Cambridge, Mass: Blackwell Publishers, 1996.

Castro, Carlos J. "Sustainable Development Mainstream and Critical Perspectives," *Organization & Environment*, vol. 17, no. 2 (June 1, 2004), pp. 195–225.

Choi, Charles. "Atoms Reach Record Temperature, Colder than Absolute Zero | LiveScience." http://www.livescience.com/25959-atoms-colder-than-absolute-zero.html (accessed January 14, 2013).

Chollett, Donna L. "'Like an Ox Yoke': Challenging the Intrinsic Virtuousness of a Grassroots Social Movement." *Critique of Anthropology*, vol. 31, no. 4 (December 1, 2011), pp. 293–311.

Chomsky, Noam. "Knowledge of Language: Its Elements and Origins." *Philosophical Transactions of the Royal Society of London.* Series B, Biological Sciences, vol. 295, no. 1077 (October 2, 1981): 223–34.

Chomsky, Noam. "Recent Contributions to the Theory of Innate Ideas: Summary of Oral Presentation." Synthese, vol. 17, no. 1 (March 1, 1967): 2–11.

Chou, Shih-wei, and Yu-Hung Tsai. "Knowledge Creation: Individual and Organizational Perspectives." *Journal of Information Science*, vol. 30, no. 3 (June 1, 2004), pp. 205–18.

Chua, Amy. "A World on the Edge." *Wilson Quarterly*, vol. 26, no. 4 (September 2002), pp. 62-78.

Clark, William C. "Sustainability Science: A Room of Its Own." *Proceedings of the National Academy of Sciences*, vol. 104, no. 6 (February 6, 2007), pp. 1737–38.

Clarke, Martin, and David Butcher. "Reconciling Hierarchy and Democracy: The Value of Management Learning." *Management Learning*, vol. 37, no. 3 (September 1, 2006), pp. 313–33.

Clauset, Aaron, Christopher Moore, and Mark E. J. Newman. "Structural Inference of Hierarchies in Networks." In *Statistical Network Analysis: Models, Issues, and New Directions*, Proceedings of the 23rd International Conference on Machine Learning, Pittsburgh, PA, 2006 (Springer, 2007), pp. 1-13.

Cochrane, Linda. "Society and the Scientific Paradigm." *International Journal of Science in Society*, vol. 2, no. 1 (January 2011), pp. 193–200.

Cohen, Jean L. "Critical Social Theory and Feminist Critiques: The Debate with Jürgen Habermas." In Johanna Meehan. Ed. *Feminists Read Habermas: Gendering the Subject of Discourse*. New York: Routledge, 1995.

Cohen, Joshua, and Joel Rogers. "Power and Reason." Archon Fung and Erik Olin Wright. Eds. *Deepening Democracy: Institutional Innovations in Empowered Participatory Governance. The Real Utopias Project IV*. London: Verso, 2003. Pp. 237–59.

Collins, Randall. "Habermas and the search for reason," *Semiotica*, vol. 64 (1989), pp. 157-169.

Collins, William P. "Does Democracy Inevitably Imply Hierarchy?" *Quality & Quantity*, vol. 20, no. 4 (November 1986), pp. 405-17.

Commager, Henry Steele. *The Empire of Reason: How Europe Imagined and America Realized the Enlightenment*. Garden City, N.Y: Anchor Press/Doubleday, 1977).

Copelli, M., R. M. Zorzenon Dos Santos, and J. S. Sá Martins. "Emergence of Hierarchy on a Network of Complementary Agents." *International Journal of Modern Physics C: Computational Physics & Physical Computation*, vol. 13, no. 6 (July 2002), pp. 783-97.

Cordero, Alberto. "Realism and Underdetermination: Some Clues from the Practices-Up." *Philosophy of Science*, vol. 68, no. 3 (2001), pp. S301–12.

Corning, Peter A. "Synergy and Self-Organization in the Evolution of Complex Systems." *Systems Research*, vol. 12, no. 2 (January 1, 1995), pp. 89–121.

Corning, Peter. "Thermoeconomics: Beyond the Second Law." *Journal of Bioeconomics*, vol. 4, no. 1 (January 1, 2002), pp. 57–88.

Corominas-Murtra, Bernat, Joaquín Goñi, Ricard V. Solé, and Carlos Rodríguez-Caso. "On the Origins of Hierarchy in Complex Networks." *Proceedings of the National Academy of Sciences*, vol. 110, no. 33 (August 13, 2013), pp. 13316–21.

Corra, Mamadi. "Separation and Exclusion: Distinctly Modern Conditions of Power?" *The Canadian Journal of Sociology / Cahiers Canadiens de Sociologie*, vol. 30, no. 1 (January 1, 2005), pp. 41–70.

Couzin, Iain D. and Jens Krause. "Self-Organization and Collective Behavior in Vertebrates." *Advances in the Study of Behavior*, vol. 32 (2003), pp. 1–75.

Craven, Paul, and Barry Wellman. "The network city." *Sociological Inquiry*, vol. 43, issue 3-4 (July 1973), pp. 57–88.

Dalton, Russel J., Susan E. Scarrow, and Bruce E. Cain. "Advanced Democracies and the New Politics." *Journal of Democracy*, vol. 15, no. 1 (2004), pp. 124–38.

Dalton, Russell J., Wilhelm P. Burklin, and Andrew Drummond. "Public Opinion and Direct Democracy." *Journal of Democracy*, vol. 12, no. 4 (2001), pp. 141–53.

Daly, Herman E. "Economics in a Full World." *Scientific American*, vol. 293, no. 3 (2005), pp. 100–107.

Daly, Herman E. "Steady-State Economics: A New Paradigm." *New Literary History*, vol. 24, no. 4 (October 1, 1993), pp. 811–16.

Danchin, Antoine. "The tree and the ring: Hierarchical and acentered structures in biology." *The Cancer Journal*, vol. 2, no. 9 (1989), pp. 285-87.

Davenport, Thomas H. "Process Management for Knowledge Work." Jan vom Brocke and Michael Rosemann. Eds. *Handbook on Business Process Management 1*. Berlin, Heidelberg: Springer Berlin Heidelberg, 2010. Pp. 17-35.

Davenport, Thomas H. Davenport and Laurence Prusak, *Working Knowledge: How Organizations Manage What They Know* (Boston: Harvard Business School Press, 1998), p. 12.

Davenport, Thomas H. Davenport, David W. De Long, and Michael C. Beers, "Successful Knowledge Management Projects," *Sloan Management Review*, vol. 39, no. 2 (Winter 1998), pp. 43–57.

Davenport, Thomas H. Davenport, Sirkka L. Jarvenpaa, and Michael C. Beers, "Improving Knowledge Work Processes," *Sloan Management Review*, 37, no. 4 (Summer 1996), pp. 53-65.

Davenport, Thomas H. Davenport, Sirkka L. Jarvenpaa, and Michael C. Beers, "Improving Knowledge Work Processes," Center for Business Innovationism, 1995.

Davenport, Thomas H., and Lawrence Prusak. "Working Knowledge: How Organizations Manage What They Know." *Ubiquity: An ACM IT Magazine and Forum* (August 1 - August 31, 2000), p. 13, http://ubiquity.acm.org/article.cfm?id=348775 (accessed June 3, 2015).

David, Marian. "The Correspondence Theory of Truth." *Stanford Encyclopedia of Philosophy*," http://plato.stanford.edu/entries/truth-correspondence/ (accessed October 2, 2011).

Davies, Bronwyn, Michael Gottsche, and Peter Bansel. "The Rise and Fall of the Neo-Liberal University." *European Journal of Education*, vol. 41, no. 2 (June 2006), pp. 305–19.

Davies, Jonathan S. "Why hierarchy won't go away: understanding the limits of "horizontalism." SSRN Scholarly Paper, 2012 (Rochester, NY: Social Science Research

Davies, Jonathan. "Local Governance and the Dialectics of Hierarchy, Market and Network." *Policy Studies*, vol. 26, no. 3/4 (September 2005), pp. 311–35.

De Duve, C. *Blueprints for a Cell*. Burlington, NC: Neil Patterson, 1991.

De Duve, C. *Life Evolving: Molecules, Mind, and Meaning*. Oxford: Oxford University Press, 2002.

De Pascale, Angelina. "Role of Entropy in Sustainable Economic Growth." *International Journal of Academic Research in Accounting, Finance and Management Sciences*, vol. 2, no. 1 (2012), pp. 293–301.

Dear, Peter. *The Intelligibility of Nature: How Science Makes Sense of the World*. Chicago: The University of Chicago Press, 2006.

Delanty, Gerard. "Habermas and Occidental Rationalism: The Politics of Identity, Social Learning, and the Cultural Limits of Moral Universalism." *Sociological Theory*, vol. 15, issue 1 (1997), pp. 30-59.

Denning, Steve, and Rod Collins. "Networks are smarter & faster than hierarchies: Q&A with Rod Collins." *Forbes* (March 31, 2011).

Denning, Steve. "Why Hierarchies Must Sign Their Own Death Warrant To Survive!" *Forbes* (December 2, 2013), http://www.forbes.com/sites/stevedenning/2013/12/02/why-hierarchies-must-sign-their-own-death-warrant-to-survive/ (accessed December 20, 2013).

Deranty, Jean-Philippe. *Beyond Communication: A Critical Study of Axel Honneth's Social Philosophy*. Leiden: Brill, 2009.

Descartes, René. *Discourse on Method and Meditations*. Mineola, N.Y: Dover Publications, 2003.

Detrain, Claire, and Jean-Louis Deneubourg. "Self-Organized Structures in a Superorganism: Do Ants 'behave' like Molecules?" *Physics of Life Reviews*, vol. 3 (2006), pp. 162–87.

Deutsch, David. *The Beginning of Infinity: Explanations that Transform the World*. New York: Viking, 2011.

Dickens, Peter. "Alienation, the Cosmos and the Self." *The Sociological Review*, vol. 57 (March 2010), pp. 47–65.

Dickens, Peter. "Alienation, the Cosmos and the Self." *The Sociological Review*, vol. 57 (March 2010), pp. 47–65.

Dietz, Mary G. "Working in Half-Truth: Some Premodern Reflections on the Partisanship of Political Speech." Paper presented at the Annual Meeting of the American Political Science Association, San Francisco, 29 August–1 September, 1996.

Drucker, Peter F. *The Age of Discontinuity*. New York: Harper & Row, 1978.

Dubreuil, Benoît. *Human Evolution and the Origins of Hierarchies: The State of Nature*. New York: Cambridge University Press, 2010.

Ducharme, Lori J., and Gary Alan Fine. "The Construction of Nonpersonhood and Demonization: Commemorating the Traitorous Reputation of Benedict Arnold." *Social Forces*, vol. 73, no. 4 (1995), pp. 1309–31.

Dussel, E. "Transmodernity and interculturality: an interpretation from the perspective of philosophy of liberation." http://www.enriquedussel.org/txt/Transmodernity%20and%20Interculturality.pdf, 2004.

Dussel, E. "World-system and 'trans'-modernity." *Nepanthia: Views from the South*, vol. 3, no. 2 (2002), pp. 221–244.

Ebers, Mark, and Leon Oerlemans. "The Variety of Governance Structures Beyond Market and Hierarchy." *Journal of Management* (October 21, 2013).

Edgerton, Sylvia A.. Michael C. MacCracken, Mark Z. Jacobson, Alberto Ayala, Carol E. Whitman, and Mark C. Trexler. "Prospects for Future Climate Change and the Reasons for Early Action." *Journal of the Air & Waste Management Association (Air & Waste Management Association)*, vol. 58, no. 11 (November 2008), pp. 1386–1400.

Edwards, Andres R. *Sustainability Revolution: Portrait of a Paradigm Shift*. Gabriola Island, Canada: New Society Publishers, 2005.

Eley, Geoff. "Nations, Publics, and Political Cultures: Placing Habermas in the Nineteenth Century." In Craig Calhoun. Ed. *Habermas and the Public Sphere*. Cambridge, MA: MIT Press, 1992.

Elgin, Duane. "A Living Systems Perspective for Humanity's Future." *World Future Review*, vol. 7, no. 2–3 (November 1, 2015), pp. 253–60.

Elsner, Wofram, Gero Hocker, and Henning Schwardt. "Simplistic vs. Complex Organization: Markets, Hierarchies, and Networks in an Organizational Triangle." SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, September 21, 2009), http://papers.ssrn.com/abstract=1476314.

Enserink, Martin. "Searching for the Mark of Cain." *Science*, vol. 289, no. 5479 (July 28, 2000), pp. 575-580.

Ergun, Mehmet Atif. "Modernity: A Myth That Manufactures Consent." *Humanities*, vol. 3, no. 4 (October 27, 2014), pp. 606–23.

Espinosa, Angela. *Complexity Approach to Sustainability: Theory and Application* (n. p.: ICP, 2011).

Eysenck, H. J. "The Origins of Violence." *Journal of Medical Ethics*, vol. 5, no. 3 (1979), pp. 105-107.

Fan, Yalin, Isaac M. Held, Shian-Jiann Lin, and Xiaolan L. Wang. "Ocean Warming Effect on Surface Gravity Wave Climate Change for the End of the Twenty-First Century." *Journal of Climate*, vol. 26, no. 16 (August 15, 2013), pp. 6046–66.

Fawcett, Paul, Rob Manwaring, and David Marsh. "Network Governance and the 2020 Summit." *Australian Journal of Political Science*, vol. 46, no. 4 (December 2011), pp. 651–67.

Ferguson, Christopher J., and Kevin M. Beaver. "Natural born killers: The genetic origins of extreme violence." *Aggression and Violent Behavior*, vol. 14, no. 5 (September), pp. 286-294.

Ferguson, Niall. "America's 'Oh Sh*t!' moment." *Newsweek* (November 7, 2011).

Ferguson, Niall. "Networks and hierarchies." *The American Interest* (June, 9 2014). http://www.theamerican-interest.com/articles/2014/06/09/networks-and-hierarchies/ (accessed June 10, 2014).

Ferree, Myra Marx, William A. Gamson, Jürgen Gerhards, and Dieter Rucht. "Four Models of the Public Sphere in Modern Democracies." *Theory & Society*, vol. 31, no. 3 (June 2002), pp. 289-324.

Fischer, Manfred M. "Innovation, Knowledge Creation and Systems of Innovation." WGI Discussion Paper No. 71/00 WGI Discussion Papers, 2000, p. 6. URL: http://epub.wu.ac.at/4242/1/WGI_DP_7100.pdf.

Fleischer, Mark. "Foundations of Swarm Intelligence: From Principles to Practice." arXiv:nlin/0502003v1 [nlin.AO], 2 Feb 2005 (accessed on January 4, 2009).

Floyd, Joshua. "Thermodynamics, Entropy and Disorder in Futures Studies." *Futures*, vol. 39, no. 9 (November 2007), pp. 1029–44.

Flyvbjerg, Bent. "Ideal Theory, Real Rationality: Habermas Versus Foucault and Nietzsche." SSRN Scholarly Paper. Rochester, NY: Social Science Research Network, (April 1, 2000).

Fodor, Jerry. *The Language of Thought*. New York: Crowell, 1975.

Fodor, Jerry. *The Mind Doesn't Work That Way: The Scope and Limits of Computational Psychology*. Cambridge: The MIT Press, 2001.

Foerster, Heinz von. "On constructing a reality." Wolfgang F. E. Preiser. Ed. *Environmental Design Research: Proceedings of the Fourth International EDRA Conference*. Stroudsburg, Pa.: Dowden, Hutchinson & Ross, 1973. Pp.35-46.

Folse, Henry J. "Bohr's Conception of the Quantum Mechanical State of a System and Its Role in the Framework of Complementarity," *arXiv:quant-ph/0210075*, October 10, 2002 (accessed May 20, 2014).

Francis, Charles and Lester R. Brown. "Plan B 4.0: Mobilizing to Save Civilization." *Renewable Agriculture and Food Systems*, vol. 25, no. 3 (September 2010), pp. 252–53.

Fraser, Nancy. "What's Critical About Critical Theory? The Case of Habermas and Gender." In Seyla Benhabib and Drucilla Cornell. Eds. *Feminism as Critique: Essays on the Politics of Gender in Late-Capitalist Society*. London: John Wiley & Sons, 1991.

Frenkel, Steven J., Marek Korczynski, Karen A. Shire, and May Tam. *On the Front Line: Organization of Work in the Information Economy.* Ithaca, NY: Cornell University Press, 1999.

Fritsch, Matthias. "The Enlightenment Promise and Its Remains: Derrida and Benjamin on the Classless Society." *Human Studies*, vol. 25, no. 3 (July 2002), pp. 289–96.

Fukuyama, Francis. "America in Decay." *Foreign Affairs*, vol. 93, issue 5 (September/October, 2014), pp. 3-26.

Fukuyama, Francis. "The end of history?" *The National Interest* (Summer 1989), pp. 3–18.

Fukuyama, Francis. *The End of History and the Last Man*. New York: Free Press, 1992.

Fung, Archon, and Erik Olin Wright. "Countervailing Power in Empowered Participatory Governance." Archon Fung and Erik Olin Wright. Eds. *Deepening Democracy: Institutional Innovations in Empowered Participatory Governance. The Real Utopias Project IV*. London: Verso, 2003. Pp. 259-291.

Garnier, Simon, et al. "The biological principles of swarm intelligence." *Swarm Intelligence*, no. 1 (2007), pp. 3-31.

Garrau, Marie. "Between gender and subjectivity: Iris Marion Young on the phenomenology of lived experience." In Miriam Bankovsky and Alice Le Goff. Eds. *Recognition Theory and Contemporary French Moral and Political Philosophy*. Manchester: Manchester University Press, 2012. Pp. 127-40.

Shkliarevsky, Gennady. "On Order and Randomness: A View from the Edge of Chaos," arXiv:1104.4133 [physics.hist-ph], April 20, 2011.

Georgescu-Roegen, Nicholas. *The Entropy Law and the Economic Process*. Cambridge, MA: Harvard University Press, 1971.

Ghisi, L. M. "Transmodernity and transmodern tourism." Keynote presented at the 15th Nordic Symposium in Tourism and Hospitality Research: Visions of Modern and Transmodern Tourism, 19–22 October, Savonlinna, Finland, 2006.

Giddens, Anthony. *Central problems in social theory*. Berkeley: University of California Press, 1979.

Gillroy, John Martin. "Requiem for Modern Politics: The Tragedy of the Enlightenment and the Challenge of the New Millennium." *The American Political Science Review,* vol. 91, no. 4 (December 1997), pp. 948–49.

Gioia, Dennis A., and Evelyn Pitre. "Multiparadigm Perspectives on Theory Building." *Academy of Management Review*, vol. 15, no. 4 (October 1, 1990), pp. 584–602.

Girard, René. *The Scapegoat*. Baltimore: Johns Hopkins University Press, 1986.

Glasby, Geoffrey P. "Sustainable Development: The Need for a New Paradigm." *Environment, Development and Sustainability*, vol. 4, no. 4 (2002), pp. 333–45.

Glasersfeld, Ernst von. "Cybernetics and cognitive development." *Cybernetics Forum*, vol. 8 (1976), pp.115-20; McCulloch, Embodiments of Mind.

Glasersfeld, Ernst von. "Introduction to Radical Constructivism," http://www.cesipc.it/wp-content/uploads/2014/02/vG1.html (accessed February 4, 2016), p. 16.

Glasersfeld, Ernst von. *Radical Constructivism: A Way of Knowing and Learning*. London: The Falmer Press, 1995.

Glieck, James. *Chaos: Making a New Science*. New York: Penguin, 1987.

Gödel, Kurt. "On Formally Undecidable Propositions of Principia Mathematica and Related Systems" (1931). http://jacqkrol.x10.mx/assets/articles/godel-1931.pdf (accessed May 12, 2011).

Gould, Steven J. *Wonderful Life*. London: Penguin Books, 1989.

Gould, Steven Jay, and Niles Eldredge. (1977). "Punctuated equilibria: the tempo and mode of evolution reconsidered." *Paleobiology*, vol. 3, no. 2 (1977), pp. 115-151.

Gowdy, John. "Avoiding Self-Organized Extinction: Toward a Co-Evolutionary Economics of Sustainability." *International Journal of Sustainable Development and World Ecology*, vol. 14, no. 1 (February 2007), pp. 27–36.

Graeber, David. *The Democracy Project: A History, a Crisis, a Movement*. New York: Spiegel & Grau, 2013.

Gray, John. *Enlightenment's Wake: Politics and Culture at the Close of the Modern Age*. London: Routledge, 1995.

Gunder, Michael. "Passionate Planning for the Other's Desire: An Agonistic Response to the Dark Side of Planning." *Progress in Planning*, vol. 60, no. 3 (2003), pp. 235-319.

Gunder, Michael. "Sustainability Planning's Saving Grace or Road to Perdition?" *Journal of Planning Education and Research*, vol. 26, no. 2 (December 1, 2006), pp. 208–21.

Guth, William D., and Ian C. MacMillan. "Strategy implementation versus middle management self-interest." *Strategic Management Journal*, vol. 7 (1986), pp. 313–327.

Habermas, Jürgen Habermas, *The Theory of Communicative Action, Volume 1: Reason and the Rationalization of Society* (Boston: Beacon Press, 1984), p. 10 (emphasis added).

Habermas, Jürgen, and Thomas McCarthy. "Hannah Arendt's Communications Concept of Power." *Social Research*, vol. 44, no. 1 (April 1, 1977), pp. 3–24.

Habermas, Jürgen. "A reply." In Axel Honneth and Hans Joas. Eds. *Communicative Action*. Cambridge: Polity Press, 1991.

Habermas, Jürgen. "Concluding Remarks." In Craig Calhoun. Ed. *Habermas and the Public Sphere*. Cambridge, MA: MIT Press, 1992. Pp. 466-67.

Habermas, Jürgen. "Modernity: An Unfinished Project." In Maurizio Passerin d'Entrèves and Seyla Benhabib. Eds. *Habermas and the Unfinished Project of Modernity*. Cambridge, Mass: MIT Press, 1997. Pp. 38-55.

Habermas, Jürgen. *Between Facts and Norms: Contributions to a Discourse Theory of Law and Democracy*. Cambridge, MA: MIT Press, 1996..

Habermas, Jürgen. *Communication and the Evolution of Society*. Boston: Beacon Press, 1979.

Habermas, Jürgen. *Legitimation Crisis*. Boston: Beacon Press, 1975.

Habermas, Jürgen. *The Theory of Communicative Action, Volume 1: Reason and the Rationalization of Society*. Boston: Beacon Press, 1984.

Habermas, Jürgen. *The Theory of Communicative Action: Lifeworld and System: A Critique of Functionalist Reason*. Vol. 2. Boston: Beacon press, 1985.

Hale, Thomas "A Climate Coalition of the Willing." *Washington Quarterly*, vol. 34, no. 1 (Winter2010/2011), pp. 89–101.

Hall, William P. "A Biological Theory of Knowledge and Applications to Real World Organizations," https://www.academia.edu/266520/A_biological_theory_of_knowledge_and_applications_to_real_world_organizations (accessed May 29, 2014), p. 7.

Hamilton, Gary G., and Nicole Woolsey Biggart. "Why People Obey: Theoretical Observations on Power and Obedience in Complex Organizations." *Sociological Perspectives*, vol. 28, no. 1 (January 1, 1985), pp. 3–28.

Hamilton, Lawrence. "Power, Domination and Human Needs." *Thesis Eleven*, vol. 119, no. 1 (December 1, 2013), pp. 47–62.

Hanegan, Tom. "French Physicist d'Espagnat wins Prestigious Templeton Prize, Reuters, September 16, 2009. http://www.reuters.com/article/idUSTRE52F2GC20090316 (accessed July 17, 2010).

Hart, W. D. "Dualism." In Samuel Guttenplan. Ed. *A Companion to the Philosophy of Mind*. Oxford: Blackwell, 1996. Pp. 265-7.

Hartz-Karp, Janette, and Michael K. Briand. "Institutionalizing Deliberative Democracy." *Journal of Public Affairs*, vol. 9, no. 2 (May 2009), pp. 125–41.

Haugaard, Mark. "Power and Social Criticism: Reflections on Power, Domination and Legitimacy." *Critical Horizons*, vol. 11, no. 1 (January 2010), pp. 51–74.

Haugaard, Mark. "Power and Truth." *European Journal of Social Theory*, vol. 15, no. 1 (February 1, 2012), pp. 73–92.

Haugaard, Mark. "Rethinking Power." SSRN Scholarly Paper. Rochester, NY: Social Science Research Network, August 21, 2011, http://papers.ssrn.com/abstract=1913739 (accessed April 23, 2015).

Hawking, Stephen W. "Gödel and the End of Physics" (presentation), Texas A&M University, March 8, 2003. http://www.hawking.org.uk/index.php/lectures/91 (accessed February 10, 2012).

Heal, Geoffrey. "Valuing Ecosystem Services." *Ecosystems*, vol. 3, no. 1 (2000), pp. 24–30.

Healy, Paul. "Rethinking Deliberative Democracy: From Deliberative Discourse to Transformative Dialogue." *Philosophy & Social Criticism*, vol. 37, no. 3 (March 2011), pp. 295–311.

Hegel, Georg Wilhelm Friedrich. *The Science of Logic*. Cambridge: Cambridge University Press, 2015.

Hellman, Geoffrey. "Einstein and Bell: Strengthening the Case of Microphysical Randomness." *Synthese*, vol. 53 (1982), pp. 445-60.

Hillier, Jean. "Agonizing over Consensus: Why Habermasian Ideals Cannot be Real." *Planning Theory*, vol. 2, no. 1 (2003), pp. 37–59.

Hoefer, Carl, and Alexander Rosenberg. "Empirical Equivalence, Underdetermination, and Systems of the World." *Philosophy of Science*, vol. 61, no. 4 (December 1994), pp. 592-607.

Hooker, C. A. "Projection, Physical Intelligibility, Objectivity and Completeness: The Divergent Ideas of Bohr and Einstein." *Brit. J. Phil. Sci.*, vol. 42 (1991), pp. 491-511.

Horgan, John. "Looking Back at 'The End of Science': More Than a Decade of Lively Debate." *Science & Spirit* (March 2008).

Horgan, John. "The End of Science Revisited." *Computer* (January 2004).

Horgan, John. *The End of Science: Facing the Limits of Knowledge in the Twilight of the Scientific Age*. Reading, MA: Addison-Wesley Pub, 1996.

Horwich, Paul. "Realism and Trut.," *Noûs*, vol. 30 (January 1, 1996), pp. 187–97.

http://www.nytimes.com/2016/05/12/opinion/campaign-stops/as-west-virginia-goes.html.

Huff, Chuck. "What Does Knowledge Have to Do with Ethics?" In Gonçalo Jorge Morais Costa. Ed. *Ethical Issues and Social Dilemmas in Knowledge Management: Organizational Innovation*. Hershey, PA., New York: IGI Global, 2011.

Innerarity, Daniel. "What Kind of Deficit? Problems of Legitimacy in the European Union." *European Journal of Social Theory*, vol. 17, no. 3 (August 1, 2014), pp. 307–25.

Irzik, Gürol. "Back to Basics: A Philosophical Critique of Constructivism." *Studies in Philosophy and Education*, vol. 20 (2001), pp. 157–75.

Isaac, Joel. *Working Knowledge: Making the Human Sciences from Parsons to Kuhn*. Cambridge: Harvard University Press, 2012.

Jablonka, Eva, and Marion J. Lamb. *Evolution in Four Dimensions*. Cambridge: The MIT Press, 2005.

Jacob, Francois. *The Possible and the Actual*. Seattle: University of Washington Press, 1982.

Jacobs, Garry. "New Paradigm: The Necessity and the Opportunity." *Cadmus*, vol. 2, no. 2 (May 2014), pp. 9–23.

Jacobs, Garry. "Uncorking the Future: Transitions to a New Paradigm." *Cadmus,* vol. 2, no. 4 (May 2015), pp. 69–82.

Jaleel, Sajna, and Alie Molly Verghis. "Knowledge Creation in Constructivist Learning." *Universal Journal of Educational Research*, vol. 3, no. 1 (2015), pp. 8–12.

Jenkins, Willis. "Sustainability Theory." In *Berkshire Encyclopedia of Sustainability, vol. 1, The Spirit of Sustainability*. Great Barrington, Mass.: Berkshire Publishing Group LLC, 2010. Pp. 380-84.

Joyner, April. "Why Hierarchies Are Good for Productivity." *Inc.* (September 2012).

Jyrämä, Annukka, and Anne Äyväri. "Can the Knowledge-Creation Process Be Managed? A Case Study of an Artist Training Project." *International Journal of Arts Management*, vol. 7, no. 2 (2005), pp. 4–14.

Kåberger, Tomas, and Bengt Månsson. "Entropy and Economic Processes—Physics Perspectives." *Ecological Economics*, vol. 36, no. 1 (January 2001), pp. 165–79.

Kahn, Robbie Pfeufer. "The Problem of Power in Habermas." *Human Studies*, vol. 11, no. 4 (November 1988), pp. 361–87.

Kahneman, Daniel. "New challenges to the rationality assumption." In Daniel Kahneman and Amos Tversky. Eds. *Choices, Values, and Frames*. Cambridge: Cambridge University Press, 2000.

Kahneman, Daniel. "New challenges to the rationality assumption." In Daniel Kahneman and Amos Tversky. Eds. *Choices, Values, and Frames*. Cambridge: Cambridge University Press, 2000.

Kallis, Giorgos, Christian Kerschner, and Joan Martinez-Alier. "The Economics of Degrowth." *Ecological Economics*, vol. 84 (December 2012), pp. 172–80.

Kant, Immanuel. *Critique of Pure Reason*. New York: Anchor Books, 1966.

Karaveli, Halil M. "An Unfulfilled Promise of Enlightenment: Kemalism and Its Liberal Critics." *Turkish Studies,* vol. 11, no. 1 (March 2010), pp. 85–102.

Katz, Richard S. "Models of Democracy: Elite Attitudes and the Democratic Deficit in the European Union." *European Union Politics*, vol. 2, no. 1 (February 1, 2001), pp. 53–79.

Kauffman, Stuart A. *Origins of Order: Self-Organization and Selection in Evolution*. Oxford: Oxford University Press, 1993.

Kellner, Douglas. "Habermas, the Public Sphere, and Democracy: A Critical Intervention." In Lewis Edwin Hahn. Ed. *Perspectives on Habermas*. Chicago: Open Court, 2000. Pp. 259-289.

Kenny, Anthony. *Descartes: A Study of His Philosophy*. New York: Random House, 1968).

Kent, Adrian. "Night Thoughts of a Quantum Physicist." arXiv:physics/9906040 [physics.pop-ph] (2000).

Khurshid, Ahmad. "Global Economic Crisis Need for a Paradigm Shift." *Policy Perspectives*, vol. 8, no. 2 (December 2011).

Knodt, Eva. "Forward." In Niklas Luhmann. *Social Systems*. Stanford: Stanford University Press, 1995.

Koestler, Arthur. *The Act of Creation*. New York: Dell, 1967.

Kolbert, Elizabeth. "Peace in Our Time." *The New Yorker*, vol. 87, no. 30 (October 3, 2011), pp. 75-78.

Korotaev, S. M., et al. "Experimental Study of Macroscopic Non-locality in Large-Scale Natural Dissipative Processes." *NeuroQuantology*, issue 4 (2005), pp. 275-94.

Kotter, John. "Hierarchy and Network: Two Structures, One Organization." *Forbes* (June 1, 2011), http://www.forbes.com/sites/johnkotter/2011/06/01/hierarchy-and-network-two-structures-one-organization/ (accessed May 20, 2014).

Krogh, Georg von. "Care in Knowledge Creation." *California Management Review*, vol. 40, no. 3 (April 1, 1998), pp. 133–53.

Kuhlman, Tom, and John Farrington. "What Is Sustainability?" *Sustainability*, vol. 2, no. 11 (November 1, 2010), pp. 3436–48.

Kuhn, Thomas Samuel. *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press, 1970.

Kurlantzick, Joshua. "The Great Democracy Meltdown." *New Republic*, vol. 242, issue 8 (June 9, 2011), pp. 12-15.

Kurlantzick, Joshua. *Democracy in Retreat: The Revolt of the Middle Class and the Worldwide Decline of Representative Government*. New Haven: Yale University Press, 2013.

Laclau, Ernesto, and Chantal Mouffe. *Hegemony and Socialist Strategy: Towards a Radical Democratic Politics*. London: Verso, 2001.

Ladyman, James. *Understanding Philosophy of Science*. London: Routledge, 2001.

Larson, Edward J. *Evolution: The Remarkable History of a Scientific Theory*. New York: Random House, 2006.

Latour, Bruno. *Politics of Nature: How to Bring the Sciences into Democracy*. Cambridge, Mass: Harvard University Press, 2004.

Lave, Jean, and Etienne Wenger. *Situated learning*. Cambridge: Cambridge University Press, 1991.

Leavitt, Harold J., and Rhonda Kaufman. "Why Hierarchies Thrive." *Harvard Business Review* (2003) http://hbr.org/product/why-hierarchies-thrive/an/R0303G-PDF-ENG (accessed June 10, 2014).

Lee, Alexander. "Who Becomes a Terrorist?: Poverty, Education, and the Origins of Political Violence." *World Politics*, vol. 63, no. 2 (2011), pp. 203-245.

Leplin, Jarrett. "The Underdetermination of Total Theories." *Erkenntnis*, vol. 47, no. 2 (January 1, 1997), pp. 203-215.

Levallois, Clément. "Can de-Growth Be Considered a Policy Option? A Historical Note on Nicholas Georgescu-Roegen and the Club of Rome." *Ecological Economics*, vol. 69, no. 11 (September 15, 2010), pp. 2271–78.

Li, Meng, and Fei Gao. "Why Nonaka Highlights Tacit Knowledge: A Critical Review," *Journal of Knowledge Management*, vol. 7, no. 4 (2003), pp. 6–14.

Liedman, Sven-Eric, and Robert Wolker. "The Enlightenment Project and Its Critics." In Sven-Eric Liedman, ed. *The Postmodernist Critique of the Project of Enlightenment*. Amsterdam: Rodopi, 1997.

Linderman, Kevin, Roger G. Schroeder, Srilata Zaheer, Charles Liedtke, and Adrian S. Choo. "Integrating Quality Management Practices with Knowledge Creation Processes." *Journal of Operations Management*, vol. 22, no. 6 (December 2004), pp. 589–607.

Lopez-Corredoira, Martin. "Sociology of modern cosmology." arXiv e-print, December 2, 2008, http://arxiv.org/abs/0812.0537 (accessed 17 July 17, 2013).

López, Ramón E., Gustavo Anríquez, and Sumeet Gulati. "Structural Change and Sustainable Development." *Journal of Environmental Economics and Management*, vol. 53, no. 3 (May 2007), pp. 307–22.

Lorca, Federico Garcia. "The Irresistible Beauty of all Things," http://laingsociety.org/colloquia/artliterature/irrestiblebeauty.htm (accessed May 25, 2016).

Lozneanu, Erzilla, et al. "Ball Lightning as a Self-Organized Complexity." arXiv:0708.4064v1 [nlin.PS] (accessed September 23, 2008).

Luhmann, Niklas. *Social Systems*. Stanford: Stanford University Press, 1995.

Luisi, Pier. "Contingency and Determinism." *Philosophical Transactions of the Royal Society of London* A, vol. 361 (2003).

Luke, Timothy W. "The System of Sustainable Degradation." *Capitalism, Nature, Society Journal* (2006).

Lupia, Arthur, and John G. Matsusaka. "Direct Democracy: New Approaches to Old Questions." *Annu. Rev. Polit. Sci.*, vol. 7 (2004), pp. 463–82.

Lynne Markus, M. Lynne, Ann Majchrzak, and Les Gasser. "A Design Theory for Systems That Support Emergent Knowledge Processes." *Mis Quarterly* (2002), pp. 179–212.

Machlup, Fritz. *Knowledge: Its Creation, Distribution and Economic Significance*. Volume I. Princeton: Princeton University Press, 1980.

Mackintosh, Stuart P. M. "Crises and Paradigm Shift." *Political Quarterly*, vol. 85, no. 4 (October 2014), pp. 406–12.

Maiello, Suzanne. "Broken links: attacks or breakdown? Notes on the origins of violence." *Journal of Child Psychotherapy*, vol. 26, no. 1 (2000), pp. 5-24.

Marcus, David. "The Horizontalists." *Dissent*, Fall 2012.

Martínez-Alier, Joan, Unai Pascual, Franck-Dominique Vivien, and Edwin Zaccai. "Sustainable de-Growth: Mapping the Context, Criticisms and Future Prospects of an Emergent Paradigm." *Ecological Economics*, vol. 69, no. 9 (July 15, 2010), pp. 1741–47.

Marwick, Alice. "Elitism Not Revolution: Social Media's Broken Promise." *New Scientist*, vol. 222, no. 2968 (May 10, 2014), pp. 28–29.

Marx, Karl. *Economic and Philosophical Manuscripts of 1844*. New York: International Publishers, 1984.

Mason, Paul. "Why it's still kicking off everywhere." *Soundings: A Journal of Politics and Culture*, vol. 53, no. 1 (2013), pp. 44–55.

Mason, Paul. *Why It's Kicking Off Everywhere: The New Global Revolutions*. London: Verso Books, 2012.

Mason, Paul. *Why It's Still Kicking Off Everywhere: The New Global Revolutions*. London: Verso, 2013.

Masterman, Margret. "The Nature of a Paradigm." In Imre Lakatos and Alan Musgrave, eds. *Criticism and the Growth of Knowledge: Proceedings of the 1965 International Colloquium in the Philosophy of Science*. Cambridge: Cambridge University

Maturana, Humberto, and Francisco Varela. *The Tree of Knowledge: The Biological Roots of Human Understanding*. Boston & London: Shambhala, 1998.

Maturana, Humberto. "Autopoiesis, structural coupling and cognition: a history of these and other notions in the biology of cognition." *Cybernetics & Human Knowing*, vol. 9, no. 3–4 (2002), pp. 5–34.

Mboney, Manasse. "Constraints on Cosmic Dynamics," arXiv:gr-qe/0309135v1 30 Sep 2003 (accessed November 21, 2008).

MccGwire, Michael. "Shifting the Paradigm." *International Affairs (Royal Institute of International Affairs)*, vol. 78, no. 1 (2002), pp. 1–28.

McCulloch, Warren S. *Embodiments of Mind*. Cambridge, Ma.: MIT Press, 1970.

McIntyre, Philip. *Creativity and Cultural Production: Issues for Media Practice*. Basingstoke; New York: Palgrave Macmillan, 2012)).

McMahon, George F., and Janusz R. Mrozek. "Economics, Entropy and Sustainability." *Hydrological Sciences-Journal-Des Sciences Hydrolo*, vol. 42, no. 4 (August 1997), pp. 501-12.

Meadows, Donella H. *The Limits to Growth: a Report for the Club of Rome's Project on the Predicament of Mankind*. New York: Universe Books, A Potomac Associates Book, 1972.

Mebratu, Desta. "Sustainability and Sustainable Development: Historical and Conceptual Review." *Environmental Impact Assessment Review*, vol. 18, no. 6 (November 1998), pp. 493–520.

Mednick, Sarnoff A. "The associate basis of the creative process." *Psychological Review*, vol. 69, no. 3 (1962), pp. 220–232.

Medows, Donella H. *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future*. Mills, VT: Chelsea Green Pub, 1992.

Medows, Donella, Jorgen Randers, and Dennis Meadows. *Limits to Growth: The Thirty-Year Update*. White River Junction, VT: Chelsea Green Publishing Company, 2004.

Michel Foucault, *Madness and Civilization*

Min, Seong-Jae. "Occupy Wall Street and Deliberative Decision-Making: Translating Theory to Practice." *Communication, Culture & Critique*, vol. 8, no. 1 (March 1, 2015), pp. 73–89.

Monod, Francois. *Chance and Necessity: Essay on the Natural Philosophy of Modern Biology*. New York: Alfred A. Knopf, 1971.

Moodysson, Jerker. "Principles and Practices of Knowledge Creation: On the Organization of 'Buzz' and 'Pipelines' in Life Science Communities." *Economic Geography*, vol. 84, no. 4 (2008), pp. 449–69.

Moore, Barrington. "Thoughts on Violence and Democracy." *Proceedings of the Academy of Political Science*, vol. 29, no. 1 (January 1, 1968), pp. 1-12.

Moravec, John W. "A New Paradigm of Knowledge Production in Higher Education." *On the Horizon*, vol. 16, no. 3 (2008), pp. 123–36.

Morowitz, H. J. *Beginnings of Cellular Life: Metabolism Recapitulates Biogenesis*. New Haven: Yale University Press, 1993.

Morriss, Peter. "What Is Freedom If It Is Not Power?" *Theoria: A Journal of Social & Political Theory*, vol. 59, no. 132 (September 11, 2012), pp. 1–25.

Mulgan, Richard. "One Cheer for Hierarchy--Accountability in Disjointed Governance." *Political Science*, vol. 55, no. 2 (December 1, 2003), pp. 6–18.

Muller, Ulrich, Jeremy I. M. Carpendale, and Leslie Smith. Eds. *The Cambridge Companion to Piaget*. Cambridge: Cambridge University Press, 2009.

Munro, Vanessa E. "On Power and Domination: Feminism and the Final Foucault." *European Journal of Political Theory*, vol. 2, no. 1 (January 1, 2003), pp. 79–99.

Nabatchi, Tina. "Addressing the Citizenship and Democratic Deficits: The Potential of Deliberative Democracy for Public Administration." *The American Review of Public Administration*, vol. 40, no. 4 (July 1, 2010), pp. 376–99.

Nagel, Ernest, and James R. Newman. *Gödel's Proof*. New York: New York University Press, 1958.

Nassar, Dalia. *The Romantic Absolute: Being and Knowing in Early German Romantic Philosophy, 1795-1804*. Chicago: University of Chicago Press, 2014.

Nature, September 8, 2009.
Network) http://papers.ssrn.com/abstract=2066812 (accessed May 21, 2014).

Neusner, Jacob. "When Intellectual Paradigms Shift: Does the End of the Old Mark the Beginning of the New?" *History and Theory*, vol. 27, no. 3 (1988), pp. 241–60.

Nonaka, Ikujiro, and Hirotaka Takeuchi. *The Knowledge-Creating Company*. New York: Oxford University Press, 1995.

Nonaka, Ikujiro, and Noboru Konno. "The Concept of 'Ba': Building a Foundation for Knowledge Creation." *California Management Review*, vol. 40, no. 3 (April 1, 1998), pp. 40–54.

Nonaka, Ikujiro, and Ryoko Toyama. "The Knowledge-Creating Theory Revisited: Knowledge Creation as a Synthesizing Process." *Knowledge Management Research & Practice*, vol. 1, no. 1 (July 9, 2003), pp. 2–10.

Nonaka, Ikujiro, Georg von Krogh, and Sven Voelpel. "Organizational Knowledge Creation Theory: Evolutionary Paths and Future Advances." *Organization Studies*, vol. 27, no. 8 (August 1, 2006), pp. 1179–1208.

Nonaka, Ikujiro, Katsuhiro Umemoto, and Dai Senoo. "From Information Processing to Knowledge Creation: A Paradigm Shift in Business Management." *Technology in Society*, vol. 18, no. 2 (1996), pp. 203–18.

Nonaka, Ikujiro. "A Dynamic Theory of Organizational Knowledge Creation." *Organization Science*, vol. 5, no. 1 (February 1994), pp. 14–39.

Nonaka, Ikujiro. "Creating Organizational Order out of Chaos: Self-Renewal in Japanese Firms." *California Management Review*, vol. 30, no. 3 (1988), pp. 57–73.

Norris, Pippa. *Democratic Deficit: Critical Citizens Revisited*. Cambridge: Cambridge University Press, 2011.

ocf-ov.htm (accessed October 8, 2012).

Otte, Richard. "Scientific Realism, Perceptual Beliefs, and Justification." *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association* 1990 (January 1, 1990), pp. 393–404.

Pajnik, Mojca. "Feminist Reflections on Habermas's Communicative Action: The Need for an Inclusive Political Theory." *European Journal of Social Theory*, vol. 9, no. 3 (August 1, 2006), pp. 385–404.

Palmer, T. N. "Quantum Reality, Complex Numbers and the Meteorological Butterfly Effect." arXiv:quant-ph/0404041v2 (accessed November 3, 2008).

Pansardi, Pamela. "Power and Freedom: Opposite or Equivalent Concepts?" *Theoria: A Journal of Social & Political Theory*, vol. 59, no. 132 (September 11, 2012), pp. 26–44.

Parietti, Guido. "On the Concept of Power (APSA 2013)" https://www.academia.edu/4285670/On_the_Concept_of_Power_APSA_2013 ((accessed April 23, 2015).

Pava, Calvin H. *Managing New Office Technology: An Organizational Strategy*. New York: The Free Press, 1983.

Piaget, Jean. *Behavior and Evolution*. New York: Pantheon Books, 1978.

Piaget, Jean. *Biology and Knowledge: An Essay on the Relations between Organic Regulations and Cognitive Processes*. Chicago: The University of Chicago Press, 1971.

Piaget, Jean. *Studies in Reflecting Abstraction*. Hove: Psychology Press, 2001.

Piaget, Jean. *The Equilibration of Cognitive Structures: The Central Problem of Intellectual Development*. Chicago: The University of Chicago Press, 1985.

Piaget, Jean. *The Moral Judgment of the Child*. New York: The Free Press, 1965.

Piaget, Jean. *The Origins of Intelligence in Children*. Madison: International Universities Press, Inc., 1998.

Piaget, Jean. *The Principles of Genetic Epistemology*. London: Routledge, 2002.

Pinker, Steven. *The Better Angels of Our Nature: Why Violence Has Declined*. New York: Viking, 2011.

Pirelli, Vito, et al. "Non-locality all the way through: Emergent Global Constraints in

Plot, Martin. "Communicative Action's Democratic Deficit: A Critique of Habermas's Contribution to Democratic Theory." *International Journal of Communication*, vol. 3 (2009), pp. 825-52.

Plowman, Donde Ashmos, Stephanie Solansky, Tammy E. Beck, LaKami Baker, Mukta Kulkarni, and Deandra Villarreal Travis. "The Role of Leadership in Emergent, Self-Organization." *The Leadership Quarterly; Leadership and Complexity*, vol. 18, no. 4 (August 2007), pp. 341–56.

Polanyi, Michael. *The tacit dimension*. London: Routledge & Kegan Paul, 1966.

Pollotta, Francesca. "Participatory Democracy in the New Millennium." *Contemporary Sociology*, vol. 42, no. 1 (January 2013), pp. 40–50.

Pomeroy, Sarah B., Stanley M. Burstein, Walter Donlan, and Jennifer Tolbert Roberts. *Ancient Greece: A Political, Social, and Cultural History*. Oxford: Oxford University Press, 1999.

Press, 1970. Pp. 59 -90.

Prigogine, Ilya, and Isabelle Stengers. *Order out of Chaos*. New York: Bantam Books, 1984.

Primas, Hans. "Hidden Determinism, Probability and Time's Arrow." H. Atmanspacher and R. Bishop. Eds. *Between Chance and Choice: Interdisciplinary Perspective on Determinism*. Thorverton: Imprint Academic, 2002. Pp. 89-113.

Primas, Hans. "Hidden Determinism, Probability, and Time's Arrow." H. Atmanspacher and R. Bishop. Eds. *Between Chance and Choice: Interdisciplinary Perspectives on Determinism.* Thorverton: Imprint Academic, 2002. Pp. 89-113. (Accessed through online version at http://philsci-archive.pitt.edu/archive/00000948/ on August 12, 2010).

Prugh, Thomas, and Erik Assadourian, "What Is Sustainability, Anyway?" *World Watch*, vol. 16, no. 5 (October 2003), pp. 10–21.

Psillos, Stathis. *Scientific Realism: How Science Tracks Truth*. London: Routledge, 1999.

Quattrone, George A. and Amos Tversky. "Contrasting rational and psychological analyses of political choice." In Daniel Kahneman and Amos Tversky. Eds. *Choices, Values, and Frames*. Cambridge: Cambridge University Press, 2000.

Raeburn, Paul. "Review of Maddox's Book What Remains to Be Discovered." *New York Times* (January 10, 1999).

Raelin, Joseph A. "The End of Managerial Control?" *Group & Organization Management*, vol. 36, no. 2 (April 1, 2011), pp. 135–60.

Rees, William E. "Globalization and Sustainability: Conflict or Convergence?" *Bulletin of Science, Technology & Society*, vol. 22, no. 4 (August 1, 2002), pp. 249–68.

Rhodes, Roderick, and Arthur William. "The New Governance: Governing without government1." *Political Studies*, vol. 44, no. 4 (1996), pp. 652–67.

Richardson, Sandra M., James F. Courtney, and John D. Haynes. "Theoretical Principles for Knowledge Management System Design: Application to Pediatric Bipolar Disorder." *Decision Support Systems*, vol. 42, no. 3 (December 2006), pp. 1321–37.

Rienstra, Byron, and Derek Hook. "Weakening Habermas: The Undoing of Communicative Rationality." *Politikon*, vol. 33, no. 3 (December 1, 2006), pp. 313–39.

Rifkin, Jeremy. *Entropy: Into the Greenhouse World*. New York: Bantam Books, 1989.

Robinson, Howard. "Dualism." In Edward N. Zalta. Ed. *The Stanford Encyclopedia of Philosophy* (Winter 2011), http://plato.stanford.edu/archives/win2011/entries/dualism/ (accessed June 21, 2011).

Robinson, John. "Squaring the Circle? Some Thoughts on the Idea of Sustainable Development." *Ecological Economics*, vol. 48, no. 4 (April 20, 2004), pp. 369–84.

Roelofs, Joan. "Networks and Democracy: It Ain't Necessarily So." *American Behavioral Scientist*, vol. 52, no. 7 (March 2009), pp. 990–1005.

Rovelli, Carlo. "Unfinished revolution." arXiv:gr-qc/0604045 (2006).

Ryan, Mary P. "Gender and Public Access: Women's Politics in Nineteenth-Century America." In Craig J. Calhoun. Ed. *Habermas and the Public Sphere*. Cambridge, MA: The MIT Press, 1992. Pp. 259-89.

Sachs, Mendel. "From Atomism to Holism in 21st Century Physics." *Annales de La Fondation Louis de Broglie* 26 (2001), pp. 389–98.

Sachs, Mendel. *Physics of the Universe*. London: World Scientific, 2010.

Salthe, Stanley. "The Spontaneous Origin of New Levels in a Scalar Hierarchy." *Entropy*, vol. 6, no. 3 (2004), pp. 327–43.

Schmidt, James. "What Enlightenment Project?" *Political Theory*, vol. 28, no. 6 (December 2000), pp. 734–57.

Schmidt, James. Ed. *What Is Enlightenment?: Eighteenth-Century Answers and Twentieth-Century Questions*. *Philosophical Traditions*. Vol. 7. Berkeley: University of California Press, 1996.

Scott, James C. *Two Cheers for Anarchism: Six Easy Pieces on Autonomy, Dignity, and Meaningful Work and Play*. Princeton: Princeton University Press, 2012.

Searle, John R. *The Construction of Social Reality*. New York: Free Press, 1995.

Shapiro, Ian. "On Non-Domination." *University of Toronto Law Journal*, vol. 62, no. 3 (Summer 2012), pp. 293–336.

Shapiro, Ian. *The State of Democratic Theory*. Princeton, N.J: Princeton University Press, 2003.

Shearing, Clifford, and Jennifer Wood. "Nodal Governance, Democracy, and the New 'Denizens.'" *Journal of Law and Society*, vol. 30, no. 3 (2003), pp. 400–419.

Sheppard, Eric, and Helga Leitner. "Quo Vadis Neoliberalism? The Remaking of Global Capitalist Governance after the Washington Consensus." *Geoforum*, vol. 41, no. 2 (March 2010), pp. 185–94.

Shkliarevsky, Gennady. "Deconstructing the Quantum Debate: Toward a Non-Classical Epistemology, arXiv:0809.1788v1 [physics.hist-ph].

Shkliarevsky, Gennady. "Of Cats and Quanta: Paradoxes of Knowing and Knowability of Reality." arXiv:1012.0289 [physics.hist-ph] (December 1, 2010).

Shkliarevsky, Gennady. "On Order and Randomness: A View from the Edge of Chaos," April 20, 2011. http://search.arxiv.org:8081/paper.jsp?r=1104.4133&qid=1372596301818mix_nCnN_-392512110&qs=Gennady+Shkliarevsky (accessed March13, 2012).

Shkliarevsky, Gennady. "Science and its discontents: is there an end to knowing?" *Systems Research and Behavioral Science*, vol. 30, no. 1, pp. 43–55.

Shkliarevsky, Gennady. "Squaring the Circle: In Quest for Sustainability." *Systems Research and Behavioral Science*, vol. 32, issue 6 (2015), pp. 629-45.

Shkliarevsky, Gennady. "The Paradox of Observing, Autopoiesis, and the Future of Social Sciences." *Systems Research and Behavioral Science*, vol. 24, issue 3 (May-June, 2007), pp. 323-32.

Simon, Herbert A. "Strategy and organizational evolution." *Strategic Management Journal*, vol. 14, no. 2 (1993), pp. 131–142.

Simon, Herbert A. "The architecture of complexity." *Proceedings of the American Philosophical Society,* vol. 106, no. 6 (1962), pp. 467–82.

Simpson, Barbara, and Christine Rachel Woods. "Knowledge Creation: Systems Thinking or Process Paradigm?" KNOWLEDGE CREATION: SYSTEMS THINKING OR PROCESS PARADIGM?" https://www.researchgate.net/publication/253988011_KNOWLEDGE_CREATION_SYSTEMS_THINKING_OR_PROCESS_PARADIGM (accessed February 1, 2016).

Simpson, Barbara, and Nick Marshall. "The Mutuality of Emotions and Learning in Organizations." *Journal of Management Inquiry*, vol. 19, no. 4 (December 1, 2010), pp. 351–65.

Simpson, Lorenzo C. "On Habermas and Particularity: Is There Room for Race and Gender on the Glassy Plains of Ideal Discourse?" *Praxis International*, vol. 6, no. 3 (1986).

Singer, Peter. *Hegel: A Very Short Introduction*. New York: Oxford University Press, 2001.

Sitrin, Marina. "Goals without demands: the new movements for real democracy." *South Atlantic Quarterly*, vol. 113, no. 2, pp. 245–58.

Sitrin, Marina. "Horizontalism: from Argentina to Wall Street." *NACLA Report on the Americas*, vol. 44, no. 6 (2011). https://nacla.org/sites/default/files/A04406010_3.pdf (accessed May 12, 2014)

Sitrin, Marina. *Everyday Revolutions: Horizontalism and Autonomy in Argentina*. London: Zed Books, 2012.

Small, John. "Why do Quantum Systems Implement Self-Referential Logic? A Simple Question with a Catastrophic Answer." D. M. Dubois. Ed. *Computing Anticipatory Systems: CASYS'05: Seventh International Conference* (American Institute of Physics, 2006).

Smith, Jordan Michael. "The Better Angels of Our Nature: Why Violence Has Declined." *Christian Science Monitor* (October 20, 2011).

Sophocles, *Antigone*, translated by Ian Johnston, https://records.viu.ca/~johnstoi/sophocles/antigone.htm (accessed April 9, 2016).

Spragens, Thomas A., Jr. "Is the Enlightenment Project Worth Saving?" *Modern Age,* vol. 43, no. 1 (Winter 2001), pp. 49-61.

Spragens, Thomas A., Jr. *Reason and Democracy*. Durham and London: Duke University Press, 1990.

Stapp, Henry P. "Quantum Theory and the Role of Mind in Nature," *arXiv:quant-ph/0103043*, March 9, 2001 (accessed March 21, 2010).

Starobin, Paul. "Who Turned Out The Enlightenment?" *National Journal*, vol. 38, issue 30 (July 29, 2006), pp. 20-26.

Steinhard, Paul, and Neil Turok. "A cyclic model of the universe." *Science*, vol. 296 (5572) (2002), pp. 1436–40.

Stewart, Angus. *Theories of Power and Domination : The Politics of Empowerment in Late Modernity*. London: Sage Publications, 2000.

Stone, Dan. "Modernity and Violence: theoretical reflections on the *Einsatzgruppen*." *Journal of Genocide Research*, vol. 1, no. 3 (1999), pp. 367-378.

Sturm, Susan. "Second Generation Employment Discrimination: A Structural

Suarez, Antoine. "Classical Demons and Quantum Angels. On 't Hooft's Deterministic Mechanics." arXiv: 0705.3974 v.1 [quant-ph] 27 May 2007 (accessed April 29, 2009).

Suchman, Lucy. *Plans and Situated Actions: The Problem of Human-Machine Interaction.* Cambridge, UK: Cambridge University Press, 1987.

Svozil, Karl. "Science at the Crossroad Between Randomness and Determinism." CDMTCS Research Report Series, CDMTCS-137, May 2000.

Targowski, Andrew. "Sixteen Related Crises and the Limits of Civilization in the 21st Century." *Comparative Civilizations Review*, vol. 69 (Fall 2013), pp. 23-32.
Teilhard de Chardin, Pierre. *The Phenomenon of Man*. New York: Harper Perennial, 1976.

Thagard, Paul, and Terrence C. Stewart. "The AHA! Experience: Creativity Through Emergent Binding in Neural Networks." *Cognitive Science*, vol. 35, no. 1 (January 2011), pp. 1–33.

the Italian Morphological Lexicon." http://www.aclweb.org/anthology/W/W04/W04-

Trigger, B. *Understanding Early Civilizations*. Cambridge: Cambridge University Press, 2003.

Tshuma, Lawrence. "Hierarchies and Government Versus Networks and Governance: Competing Regulatory Paradigms in Global Economic Regulation." *Social & Legal Studies*, vol. 9, no. 1 (March 1, 2000), pp 115–42.

Uhl-Bien, Mary, Russ Marion, and Bill McKelvey. "Complexity Leadership Theory: Shifting Leadership from the Industrial Age to the Knowledge Era." *The Leadership Quarterly*; *Leadership and Complexity*, vol. 18, no. 4 (August 2007), pp. 298–318.

Van Olffen, Woody, and Georges Romme. "The role of hierarchy in self-organizing systems." *Human Systems Management*, vol. 14 (1995), pp. 199–206.

Vattimo, Gianni. *The Transparent Society*. London: Wiley, 1992.

Venn, Couze. "Altered states: post-enlightenment cosmopolitanism and transmodern socialities." *Theory, Culture & Society*, vol. 19, no. 1–2 (2002), pp. 65–80.

Venn, Couze. "The Enlightenment." *Theory, Culture & Society*, vol. 23, no. 2/3 (March 2006), pp. 477–86.

Vicsek, Tamas. "The Bigger Picture," *Nature*, Vol. 418 (11 July 2002), p. 131.

Viscido, Steven V., et al. "Factors influencing the structure and maintenance of fish schools." *Ecological Modeling*, vol. 206 (2007), pp. 153-165.

Vitale, Denise. "Between Deliberative and Participatory Democracy: A Contribution on Habermas." *Philosophy & Social Criticism*, vol. 32, no. 6 (September 1, 2006), pp. 739–66.

Vivien, Franck-Dominique. "Sustainable Development: An Overview of Economic Proposals." Gaell Mainguy. Ed. *S.A.P.I.EN.S. Surveys and Perspectives Integrating Environment and Society*, no. 1.2 (November 15, 2008). http://sapiens.revues.org/227.

Von Krogh, Georg. "Care in Knowledge Creation." *California Management Review*, vol. 40, no. 3 (April 1, 1998).

Vygotskii, Lev. *Mind in Society: The Development of Higher Psychological Processes*. Cambridge: Harvard University Press, 1978.

Vygotsky, Lev. "The Problem of the Cultural Development of the Child" (essay published in 1929), http://www.marxists.org/archive/vygotsky/works/1929/cultural_development.htm (accessed Sept.24, 2004).

Vygotsky, Lev. *Mind in Society: The Development of Higher Psychological Processes.* Cambridge. MA: Harvard University Press, 1978.

Wagner, Gerhard, and Heinz Zipprian. "Habermas on Power and Rationality." *Sociological Theory*, vol. 7, no. 1 (Spring 1989), pp. 102–9.

Walter, Ryan. "Foucault and Radical Deliberative Democracy." *Australian Journal of Political Science*, vol. 43, no. 3 (2008), pp. 531–46.

Wapenaar, Kees, and Roel Snieder. "Determinism: Chaos Tamed." *Nature*, vol. 447, no. 7145 (June 7, 2007), pp. 643–643.

Warren, Mark E. "What Should We Expect from More Democracy?: Radically Democratic Responses to Politics." *Political Theory*, vol. 24, no. 2 (May 1, 1996), pp. 241–70.

Weber, Max. *Economy and Society: An Outline of an Interpretive Sociology*. Vol. 2. Berkeley, Los Angeles and London: University of California Press, 1978.

Weiler, Hans N. "Whose Knowledge Matters? Development and the Politics of Knowledge." Theodor Hanf, Hans N. Weiler, and Helga Dickow. Eds. *Entwicklung Als Beruf*. Baden-Baden: Nomos, 2009), pp. 485–96.

Weinberg, Steven. "The Crisis of Big Science." *The New York Review of Books*, May 10, 2012.

Weston, Thomas. "Approximate Truth and Scientific Realism." *Philosophy of Science*, vol. 59, no. 1 (March 1, 1992), pp. 53–74.

Wierzbicki, Andrzej P., and Yoshiteru Nakamori. "The Episteme of Knowledge Civilisation," https://www.researchgate.net/publication/29681579_The_Episteme_of_Knowledge_Civilisation (accessed February 22, 2016).

Wierzbicki, Andrzej P., and Yoshiteru Nakamori, "The Episteme of Knowledge Civilisation," https://www.researchgate.net/publication/29681579_The_Episteme_of_Knowledge_Civilisation (accessed February 22, 2016), pp. 12-13; see also Fritz Machlup, *Knowledge: Its Creation, Distribution and Economic Significance*, volume I (Princeton: Princeton University Press, 1980), particularly chap. 5.

Winegard, William C. *For Whose Benefit? Report on Canada's Official Development Assistance*. Ottawa: Government of Canada, 1987.

Wolfram, Stephen. *A New Kind of Science*. Champaign, IL: Wolfram Media, 2002.

Young, Jeffrey T. "Entropy and Natural Resource Scarcity: A Reply to the Critics." *Journal of Environmental Economics and Management*, vol. 26, no. 2 (March 1994), pp. 210–13.

Young, Jeffrey T. "Is the Entropy Law Relevant to the Economics of Natural Resource Scarcity?" *Journal of Environmental Economics and Management*, vol. 21, no. 2 (September 1991), pp. 169–79.

Yurtsever, Ulvi. "Quantum mechanics and Algorithmic Randomness." arXiv:quant-ph/9806059v2 13 Dec 2000 (accessed May 14, 2008).

Zanghi, Nina, and Roderich Tumulka. "John Bell Across Space and Time." *American Scientist* (October 2003). http://www.americanscientist.org/bookshelf/pub/john-bell-across-space-and-time (accessed January 6, 2009).

Zickfeld, Kirsten, Michael Eby, Andrew J. Weaver, Kaitlin Alexander, Elisabeth Crespin, Neil R. Edwards, Alexey V. Eliseev. "Long-Term Climate Change Commitment and Reversibility: An EMIC Intercomparison." *Journal of Climate*, vol. 26, no. 16 (August 15, 2013), pp. 5782–5809.